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DOCUMENTATION OF THE IDA TACTICAL AIR MODEL (IDATAM) COMPUTER P--ETC(U)
FEB 79 L B ANDERSON, P A FRAZIER, M J HUTZLER

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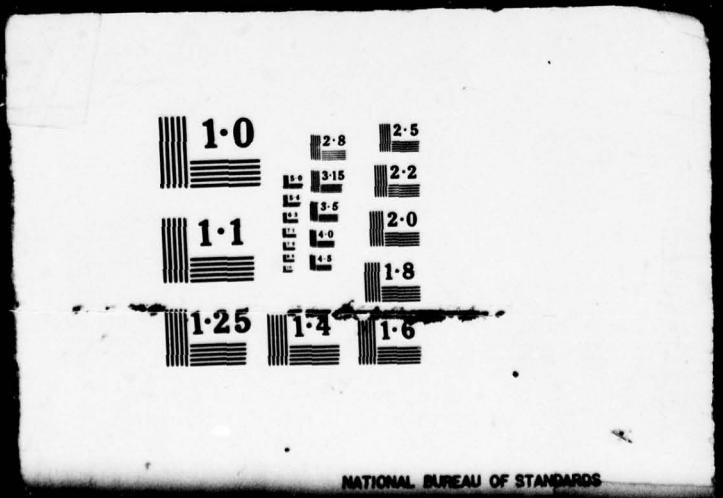

(12) LEVEL VII

IDA PAPER P-1409

DOCUMENTATION OF THE IDA TACTICAL AIR MODEL (IDATAM) COMPUTER PROGRAM

Lowell Bruce Anderson
Patricia A. Frazier
Mary J. Hutzler
Frances Jan Smoot

February 1979

INSTITUTE FOR DEFENSE ANALYSES
PROGRAM ANALYSIS DIVISION

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) DOCUMENTATION OF THE IDA TACTICAL AIR MODEL (IDATAM) COMPUTER PROGRAM	5. TYPE OF REPORT & PERIOD COVERED FINAL 6. PERFORMING ORG. REPORT NUMBER IDA PAPER P-1409
7. AUTHOR(s) Lowell Bruce Anderson, Patricia A. Frazier, Mary J. Hutzler, Frances Jan Smoot	8. CONTRACT OR GRANT NUMBER(s) IDA Central Research Program
9. PERFORMING ORGANIZATION NAME AND ADDRESS INSTITUTE FOR DEFENSE ANALYSES 400 Army-Navy Drive Arlington, VA. 22202	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS N/A
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE February 1979 13. NUMBER OF PAGES 134
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION DOWNGRADING SCHEDULE N/A

16. DISTRIBUTION STATEMENT (of this Report)

This document is unclassified and suitable for public release.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Air Combat, Air Campaign, Theater-level Combat Model, Conventional Combat Simulation, F-15, F-16, F-111, A-10, FENCER, FLOGGER, BACKFIRE, PATRIOT, AAA, ROLAND, STINGER, SA-6, SA-7, SA-8, SA-9, ZSU-23, Aircraft, SAMs, Close Air Support, Interdiction

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Institute for Defense Analyses Tactical Air Model (IDATAM) is a theater-level, deterministic model of non-nuclear air combat between two opposing forces. The purpose of this paper is to present a sufficiently adequate documentation of the IDATAM computer program so that a prospective user of IDATAM can implement and run this program. A detailed prescription of the logic of IDATAM is not currently available. However, this

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

19. (Continued) Airbase Attack, Air Defense, Escorts, SAM-Suppression, Dual Purpose Aircraft, Multimission Aircraft Helicopters, Shelters, Runways, Airbases, Passive Defenses, Interoperability, NATO, Warsaw Pact, Attrition

20. (Continued) Abs D A paper also presents a brief overview of IDATAM. We hope that, with sufficient effort, one could use the overview and the documentation presented here, along with a copy of the IDATAM computer program, to learn to use IDATAM. This learning could be accomplished by reading the computer code, or by running IDATAM for many parametric variations, or both. IDATAM is programmed in FORTRAN, and the code is relatively straightforward.

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PROGRAM ANALYSIS DIVISION
400 Army-Navy Drive, Arlington, Virginia 22202

IDA Central Research Program

CONTENTS

FIGURES

ACKNOWLEDGMENTS

Ms. Kathleen Gardner of the Science and Technology Division of IDA, Mr. Edward Kerlin of the Program Analysis Division of IDA, and Ms. Nita Schriner of IDA Headquarters provided very helpful reviews of this paper.

INTRODUCTION

The Institute for Defense Analyses Tactical Air Model (IDATAM) is a theater-level, deterministic model of non-nuclear air combat between two opposing forces.

The purpose of this paper is to present a sufficiently adequate documentation of the IDATAM computer program so that a prospective user of IDATAM can implement and run this program. A detailed description of the logic of IDATAM is not currently available. However, this paper presents a brief overview of IDATAM.

We hope that, with sufficient effort, one could use the overview and the documentation presented here, along with a copy of the IDATAM computer program, to learn to use IDATAM. This learning could be accomplished by reading the computer code, or by running IDATAM for many parametric variations, or both.

IDATAM is programmed in FORTRAN, and the code is relatively straightforward. To facilitate using this code, all of the inputs and the major working variables are defined in Appendix H. Copies of the IDATAM computer program (which contains numerous comment statements) can be obtained from the Institute for Defense Analyses.

Chapter I

A BRIEF OVERVIEW OF IDATAM

A. RATIONALE BEHIND THE DEVELOPMENT OF IDATAM

IDATAM was developed to allow consideration of various types of aircraft, ground-to-air weapons, and related resources at a comparable level of detail. Other currently available models are either not able to compare these resources or would have significant limitations if they were used to do so.

For example, relatively detailed models do not consider the multiple offensive and multiple defensive uses for aircraft belonging to each side. Thus, these models cannot consider comprehensive measures of effectiveness which allow, for example, trading off aircraft that can fly defensive missions one day and offensive missions the next with surface-to-air missile systems (SAMs) that can only provide air defense. On the other hand, more aggregated models tend to simplify the details of what they model because either (a) they were intended to be "short and simple" models, (b) they also include an optimization structure which then precludes putting too much emphasis on details, or (c) they also include ground combat and other interactions, which also precludes putting too much emphasis on details (of air combat). For example, several reviewers have felt that the air model inside the IDAGAM I ground-air model is the most detailed of the currently available theater-level ground-air models.[1] Yet, while IDAGAM I plays air-to-air combat in some detail and accounts for ground-to-air combat, it does not play ground-to-air combat

[1]IDAGAM I is described in References 1 and 2.

in the detail that we feel is required to trade off ground-to-air systems for aircraft. Accordingly, we developed IDATAM by basing it on the overall structure of the air combat model of IDAGAM I and by improving in general on the details played and in particular on the way that ground-to-air systems are played.

IDATAM has been tested and used in several studies at IDA.

B. RESOURCES PLAYED

1. Types of Resources

IDATAM can play multiple types of aircraft. The computer program is currently dimensioned to play up to 15 types of aircraft for each side. In some studies done at IDA, we played 10 types of aircraft on each side as follows:

Types of Aircraft Played

NATO	Warsaw Pact
A-7 or A-10	BACKFIRE
F-4	BADGER
F-5 or Mirage-5	FENCER
F-15	FISHBED-H and earlier
F-16	FISHBED-J and later
F-104	FITTER
F-111	FLOGGER
HARRIER or JAGUAR or ALPHAJET	Postulated Fighter
MRCA	CUB-C
All Electronic Warfare and Reconnaissance Aircraft	All Electornic Warefare and Reconnaissance Aircraft except the CUB-C

IDATAM can play multiple types of high and medium altitude air defense systems (HIMADS) and multiple types of short-range air defense systems (SHORADS). The computer program is currently dimensioned to play up to 3 types of HIMADS and

6 types of SHORADS on each side.[1] In some studies at IDA, we played 3 types of HIMADS on each side, 5 types of NATO SHORADS, and 4 types of Warsaw Pact SHORADS as follows:

Types of HIMADS Played

NATO	Warsaw Pact
IMPROVED HAWK	SA-2
NIKE-HERCULES	SA-4
PATRIOT	SA-3 or SA-6

Types of SHORADS Played

NATO	Warsaw Pact
VULCAN (Gun)	ZSU-23 (Gun)
NEW GUN	SA-7
IMPROVED CHAPARRAL	SA-8
ROLAND	
STINGER	

Virtually every effectiveness and resource-level input to IDATAM that can be associated with a type of aircraft (or HIMAD or SHORAD) is a function of the type of aircraft (or HIMAD or SHORAD). In addition, probabilities of kill are functions of both the particular type of shooter (F-15, F-16, PATRIOT, ROLAND, etc.) and particular type of target involved.

IDATAM does not account for missiles or ammunition for aircraft except for munitions used (by type) on close air support and interdiction missions. IDATAM does account for missiles used by SAMs (and ammunition used by guns) and reduces the effectiveness of these systems if there is a shortage in their supply of missiles or ammunition.

[1]In the IDATAM computer program, HIMADS are referred to as long-range SAMs and SHORADS are referred to as medium-range SAMs.

IDATAM plays one type of shelter for aircraft and one type of helicopter on each side.

Within each geographic area (described below) IDATAM plays an input number of airbases with the aggregation assumption that if, for example, there are ten airbases in an area, then one-tenth of the aircraft, the shelters, and the SHORADS providing point defenses in that area are on each of the ten airbases. Attacking aircraft, however, need not attack all ten airbases on each raid (e.g., they can attempt to saturate the point defenses by attacking fewer airbases).

2. Status of Resources

Aircraft can be in any of the following conditions. Aircraft can be undamaged on their home airbase either ready to fly missions or on quick reaction alert (QRA) status. In general, in flying missions, aircraft can (a) successfully deliver their ordnance and return home undamaged, (b) be forced to jettison their ordnance and return home undamaged but unsuccessful, (c) be damaged (but not destroyed) either before or after delivering their ordnance and return damaged either to a combat airbase or to a notional repair airbase, or (d) be destroyed either before or after delivering their ordnance. Thus, aircraft can also be in a damaged condition either on a combat airbase or in a notional repair sanctuary. Finally, aircraft can be in an attrition replacement pool--these aircraft are used to fill slots vacated by destroyed aircraft.

Helicopters can be in the same conditions as aircraft, except that all damaged helicopters are assumed to go to a notional helicopter repair pool.

SAMs (including guns) can be located in various parts of the theater (described below) in an undamaged condition. In the course of a raid SAMs can (a) remain usable throughout the raid, (b) be suppressed (unable to shoot) but be

undamaged and usable against the next raid, (c) be damaged and sent to a notional repair pool, or (d) be destroyed. Thus, SAMs can be in a damaged condition in a repair pool. SAMs can also be in an attrition replacement pool--these SAMs are used to fill slots vacated by destroyed SAMs.

Shelters are assumed to be either undamaged or completely destroyed. It is possible to play that an input fraction of the shelters that are hit in such a way that the aircraft inside them are destroyed are themselves not destroyed. Shelters cannot be automatically overrun by advancing enemy troops, but this event can be simulated, if desired, by reading in inputs during the war to reduce the number of shelters.

If there are not enough shelters for all of the aircraft on a base, and if that base is attacked, then the unsheltered aircraft can be destroyed using different (higher) effectiveness parameters than are used for attacking shelters. In addition, input parameters can control the level of dispersion of unsheltered aircraft.

IDATAM also models the attack and repair of runways. If a runway is closed by an enemy attack, several options are available which approximate the dispersal of aircraft to other airbases that are not closed. By selecting from these options, a user of IDATAM can roughly bound the effectiveness produced by various levels of airbase interoperability. Attacks on maintenance facilities are not modeled in IDATAM. (If desired, it would be relatively easy to change the code of IDATAM to play these attacks in a simple way.)

3. Theater Structure and Locations of Resources

IDATAM can be used to play a full theater or any portion of a theater. The theater played in IDATAM can be illustrated with an example (see Figure 1). The theater is divided into

Figure 1. AN EXAMPLE OF IDATAM'S THEATER

one or two parallel sectors and two communication zones.[1] Each sector is further divided into a combat area, an air defense Belt, a forward area, and a rear area for each side.[2] The opposing sides are separated by the FEBA (forward edge of the battle area).

Some assumptions made about the locations of resources are as follows. All helicopters and targets for aircraft on close air support missions are in the combat area. SAMs providing belt defense are in the Belt. All Interdiction targets are assumed to be in the forward area. Airbases can be in the forward area, the rear area, and the communications zone. Airbases can be protected by aircraft, ground-based area defenses, and ground-based point defenses.

The reason for playing airbases at various distances from the FEBA is to assess higher attrition to aircraft that penetrate deeper into enemy territory, and to allow range-payload tradeoffs to be modeled. (For details on this structure, see Section I.B.2.b of Volume I of Reference 2 and Section I.A.1 of Reference 1.)

C. MISSIONS FOR AIRCRAFT

In general, aircraft in IDATAM can do three categories of offensive missions (attack, or escort, or SAM-suppression) against three categories of targets (ground targets in the combat area--Close Air Support (CAS), or ground targets in the forward area--Interdiction, or against airbases), and they can also fly SAM-suppression missions against HIMADS in the Belt. Also, aircraft can fly two types of defensive missions: battlefield defense against CAS aircraft (and against any other aircraft they might detect) and airbase defense (against

[1]"Sectors" conceptually correspond to what are called "regions" in Reference 2.

[2]Note that the "forward area" is behind the air defense Belt, so it is really the forward part of a rear area (and likewise the "rear area" is really the rearward part of a rear area).

both airbase attack aircraft and interdiction aircraft--that is, IDATAM assumes that airbase defense is really an area defense of all targets behind the Belt). Thus, IDATAM plays ten different offensive missions and two different defensive missions as follows:[1,2]

MISSIONS FOR AIRCRAFT

Offensive Missions

CASA : Close air support--attack
CASE : Close air support--escort
CASS : Close air support--SAM-suppression
INTDA: Interdiction--attack
INTDE: Interdiction--escort
INTDS: Interdiction--SAM-suppression
ABA : Airbase attack
ABAE : Airbase attack--escort
ABAS : Airbase attack--SAM-suppression
BSSUP: Belt SAM-suppression

Defensive Missions

BD : Battlefield Defense (i.e, area defense in front of the Belt)
ABD : Airbase Defense (i.e., area defense behind the Belt)

---

[1]The internal logic of the model further subdivides the airbase attack missions into attacks against forward, rear, and COMMZ airbases and subdivides airbase defense missions into defense of these three groups of airbases.

[2]Electronic warfare, reconnaissance, and command and control aircraft can be accounted for by sending these aircraft on appropriate offensive (or defensive) missions but with no offensive (or defensive) capability. The effectiveness contribution that these aircraft make is considered only through the input parameters governing other resources.

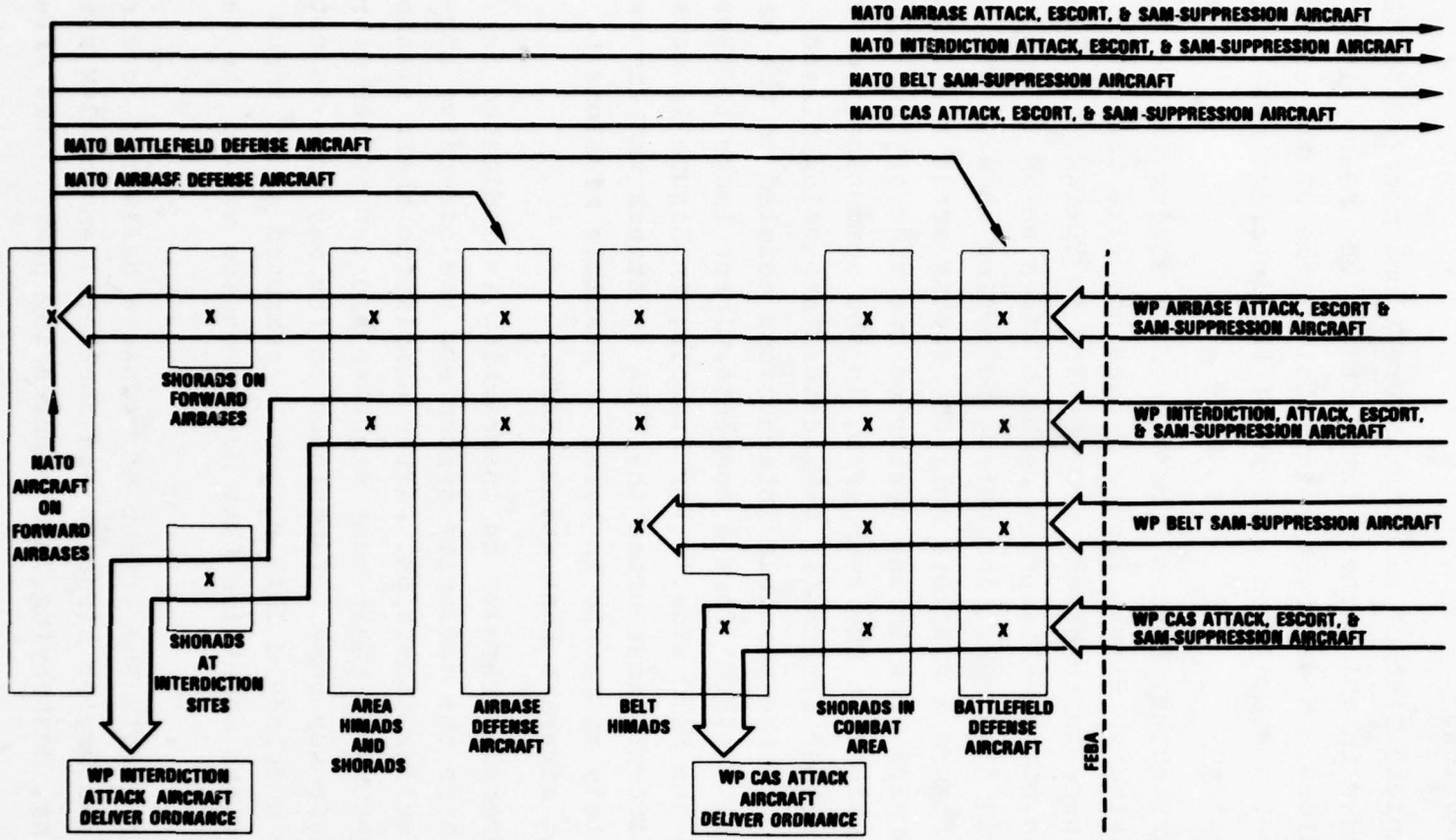
D. INTERACTIONS

A complete list of all the interactions modeled in IDATAM and the order in which these interactions occur are given in the appendices. However, by sacrificing some of the completeness given there, a simplified picture of the interactions in IDATAM can be obtained.

In particular, Figure 2 results from making the following simplifications. First, Figure 2 does not give the order in which these interactions are modeled in IDATAM. Second, IDATAM also plays helicopters on both sides which is not portrayed in Figure 2. And third, referring back to Figure 1, note that Figure 2 displays only the combat area, the Belt, and the forward area in one sector on one side of the FEBA. The interactions in the rear area, in the communications zone, and in the other sector (if two sectors are being played) are analogous; and the possible interactions modeled on the Warsaw Pact side of the FEBA form a complete mirror image to those modeled on the NATO side. (For example, in Figure 2, note that the NATO aircraft that cross the FEBA to attack the Warsaw Pact are completely symmetric in terms of possible missions to the Warsaw Pact aircraft that attack NATO.)

In general, wherever an interaction is indicated in Figure 2, both the defensive system and the offensive aircraft can suffer attrition. After completing their mission, aircraft return to their home airbases and can suffer attrition on their way home. (Attrition on the way home is not explicitly modeled in IDATAM, but is computed as an input fraction of the attrition that occurs on the way to the target area.)

IDATAM models the effect of ordnance delivered on airbases (by destroying aircraft and shelters) and on SAM sites (by damaging, destroying, and suppressing SAMs). The effects



X denotes the interactions that can occur between NATO and WP resources on the NATO side of the FEBA (a completely symmetric set of interactions is modeled on the WP side of the FEBA).

Note: This figure is stylized, so it does not give the order in which interactions occur in IDATAM, nor does it include deep attacks or helicopters.

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Figure 2. INTERACTIONS MODELED IN IDATAM

of ordnance delivered in support of ground troops (i.e., on close air support and interdiction missions) is not directly modeled, but the amounts of such ordnance (which can be scaled by input weighting factors) contribute to selected measures of effectiveness.

E. LOGICAL STRUCTURE OF IDATAM

IDATAM is a fixed time-step model. IDATAM places no formal restriction on how long this time-step should be. However, for several reasons it is useful to play two, three, or four time-steps per "flying" day.[1] In the studies at IDA, we played three time-steps per day. That is, the inputs were coded so that one iteration (or cycle) through IDATAM represents the interactions that occur over one-third of a day. Alternatively, this structure can be pictured as playing three raids per day, where each cycle through IDATAM plays the interactions that occur on one raid.

The total number of time-steps to be played (i.e., the length of the war) must also be input, and IDATAM will play this number of time-steps regardless of what happens to either side. For example, with three cycles per day, we modeled a 10 day war by requesting IDATAM to play 30 cycles of combat. (Note that IDATAM does not attempt to "optimize" or to make any calculations by "counting backwards" from the end of the war. Thus, for example, the output of IDATAM for a "30 cycle" war is identical to the output that would be obtained for the first 30 cycles of any war longer than 30 cycles.)

The basic operation is as follows:

Step 1. IDATAM reads the initial forces and effectiveness parameters and prints out these inputs. IDATAM allows

[1]IDATAM has no *automated* provision to play night attacks (assuming, of course, that effectiveness parameters would differ significantly between daylight and nighttime attack).

all inputs to be changed over time. For example, IDATAM can allow additional aircraft to enter the theater on day three, sortie rates to change on day four, and mission assignments to change on day five. These changes in inputs are called "time-t" inputs and are also read in and printed out in this step--but they are not used by the model until Step 7 of the appropriate cycle. (If the user of IDATAM only wants a printout of his inputs, he can direct the model to stop at this step; otherwise IDATAM continues.)

Step 2. IDATAM sets the cycle counter to one.

Step 3. Aircraft are allocated to missions for the current cycle by applying the input mission assignments to the numbers of aircraft on each airbase while considering such factors as range restrictions and which enemy airbases (if any) to attack.

Step 4. In this step, IDATAM computes all air-to-air, SAM-to-air, and air-to-SAM attrition during the cycle. In addition to assessing this attrition, the outputs of this step include the number of successful close air support, interdiction, and airbase attack sorties (by aircraft type and by geographic area).

Step 5. Attrition to aircraft on the ground caused by successful airbase attack sorties is calculated in this step.

Step 6. Selected measures of effectiveness are calculated in this step by considering attrition to aircraft and SAMs, and by considering successful close air support sorties and interdiction sorties and the potential effects of the munitions delivered on these sorties.

Step 7. If, according to the "time-t" inputs, force levels or effectiveness parameters are to be updated at the end of this cycle (so that the update takes effect at the beginning of the next cycle), then these updates are made during this step.

Step 8. If requested, tabular "summary" results are printed out at this step. IDATAM can print 21 formated tables of outputs. These tables provide a considerable variety of results which range from details about particular weapons through killer-target scoreboards and aggregated measures of effectiveness.

Step 9. The cycle counter is compared to the input number of cycles to be played. If the number of cycles to be played is greater than the cycle counter, then the cycle counter is incremented by one and the model goes back to Step 3. Otherwise, the model stops.

F. SIZE OF IDATAM

As is described in Chapter II, IDATAM is broken into overlays to fit into IDA's CDC 6400 computer. Taken in total, IDATAM consists of approximately 10,000 executable FORTRAN statements and over 1,000 comment statements. In addition to these statements, the IDATAM computer program as currently dimensioned (15 types of aircraft, 3 types of HIMADs, 6 types of SHORADS, etc.) reserves about 10,000 storage locations (in blank common) for the inputs and about 10,000 storage locations (mostly in labeled common) for working variables. In total, there are 277 different input variables.

The running time of IDATAM depends on the number of sectors and different types of aircraft, SAM's, etc. being played, and on whether overlaying is required (as it is on IDA's computer). Due to this overlaying structure, the Peripheral Processor (PP) time is much larger than the Central Processor (CP) time on IDA's computer. For example, the runs of IDATAM made in conjunction with a major IDA study modeled one sector, 10 types of aircraft, 3 types of HIMADS, and 4 or 5 types of SHORADS for each side; and 3 cycles per day were played. These runs required about one minute of CP time and eleven

minutes of PP time for a 5 day (15 cycle) war, and required about one and one-half minutes of CP time and twenty minutes of PP time for a 10 day (30 cycle) war.

Chapter II

DOCUMENTATION OF IDATAM COMPUTER PROGRAM

A. THE IDATAM COMPUTER PROGRAM

Since IDATAM is a larger program than IDA's CDC 6400 computer can handle in its core memory (150 K octal), IDATAM is broken into reloadable overlays which can be executed independently. There is the main overlay, five primary overlays, and two secondary overlays. The overlays are stored on two files: "IDATAM" and "ATTRTN" (see Appendix E). Program MAIN directs the model's operation. MAIN first calls primary overlay TZERO (which is overlay 1) to initialize the cumulative working variables and to read and print out all input variables. (Initial values for the input variables must be input by the user of IDATAM, values for the working variables are calculated from the input variables.) Primary overlay PSAIR (which is overlay 5) is the print summary routine, and is called next to print out in tabular form some of the initial inputs associated with the types and numbers of resources being played. The remainder of MAIN is a loop over the number of cycles to be played. Within this loop, a switch is set to indicate whether or not a detailed print is desired for the cycle; and this loop calls primary overlays 2, 3, and 4. After all attrition has been assessed, TIMET is called if there are inputs to be updated. Summary tables are then automatically printed by PSAIR for the first cycle, the last cycle, and every time a detail print is wanted. Note that the summary tables will reflect any updates made in TIMET. Summary tables can be directly requested for any cycle (up to 30 cycles per run). Figure 3 is a flow chart of MAIN.

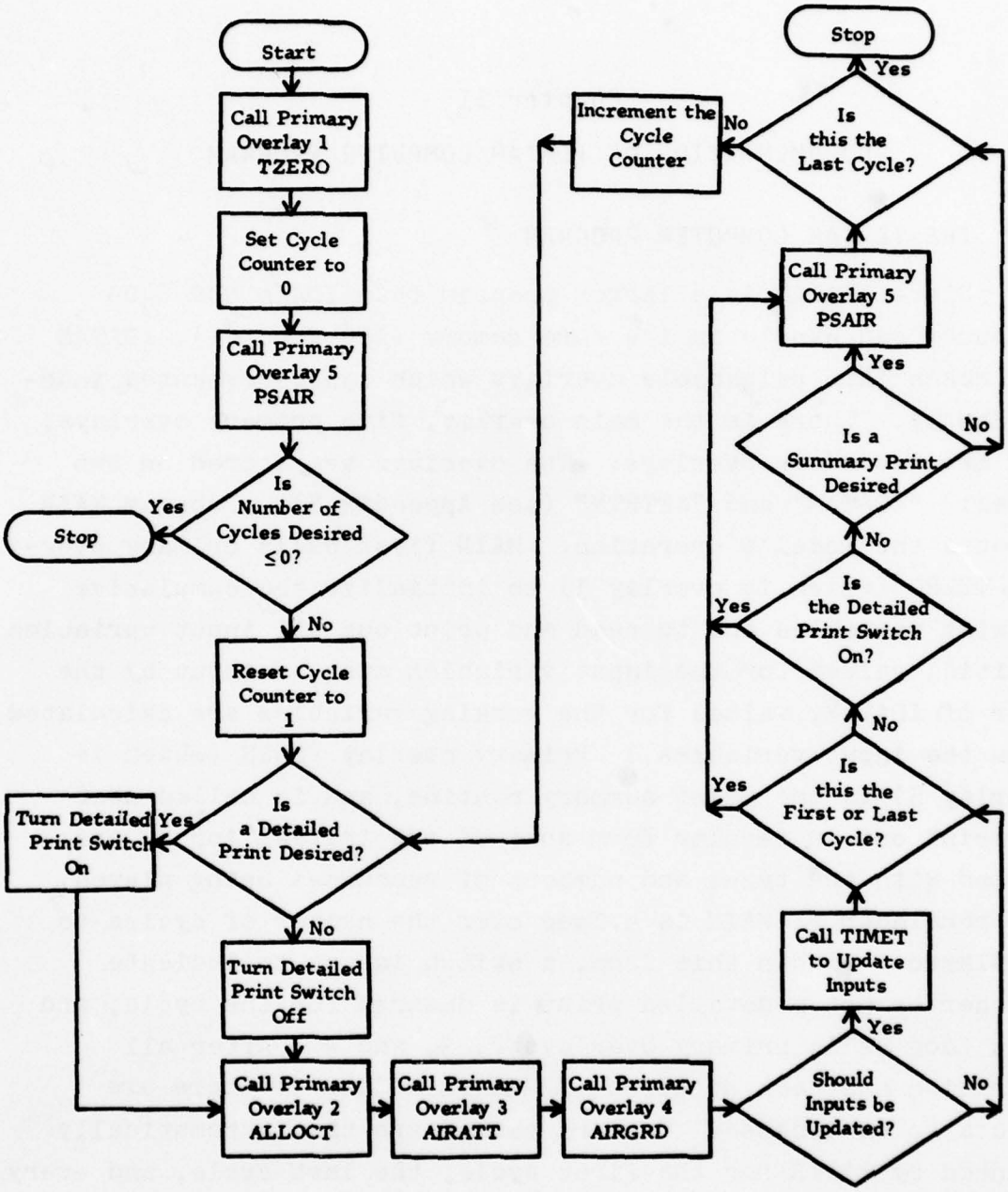


Figure 3. A FLOW CHART OF MAIN

Primary overlays 2, 3, and 4 are divided by comment statements into many modular sections (see Appendix A--Description of Sections). Program ALLOCT in primary overlay 2 is di ded by comment statements into six modular sections, which compute weighted numbers of target aircraft on each notional airbase, allocate aircraft to the forward, rear, and communication zone areas, and compute numbers of sorties and air munitions load factors.

Primary overlay 3 is more complex. Program AIRATT, the air-to-air attrition routine, is in overlay 3. This program first initializes the necessary working variables, next calls the secondary overlays to compute attrition for the two sides and for each sector, and then applies SAM kills to SAM inventories. Figure 4 is a flow chart of primary overlay 3.

As can be seen in Figures 5 and 6, the structure of the secondary overlays is straightforward. Program AOVL1 calls subroutines ATTR1, ATTR2, and ATTR3. Similarly, AOVL2 calls subroutines ATTR4, ATTR5, and ATTR6. These attrition routines are broken into logical segments. ATTR1 computes attrition up to and including the bombing of airbases in the forward area. ATTR2 then computes attrition up through interdiction attackers delivering ordnance to interdiction targets. ATTR3 goes through the attack of rear airbases, ATTR4 goes through the attack of airbases in the communication zone. Interactions in the combat zone, which include close air support and helicopters, are in ATTR5. ATTR6 computes attrition of attackers on their way home, converts sorties back to aircraft, and parcels out aircraft killed and damaged in air.

All interactions, except airbase attack air-to-ground, are computed in separate sections (one interaction per section) within the secondary overlays. These sections are separated by comment statements in the computer code and are

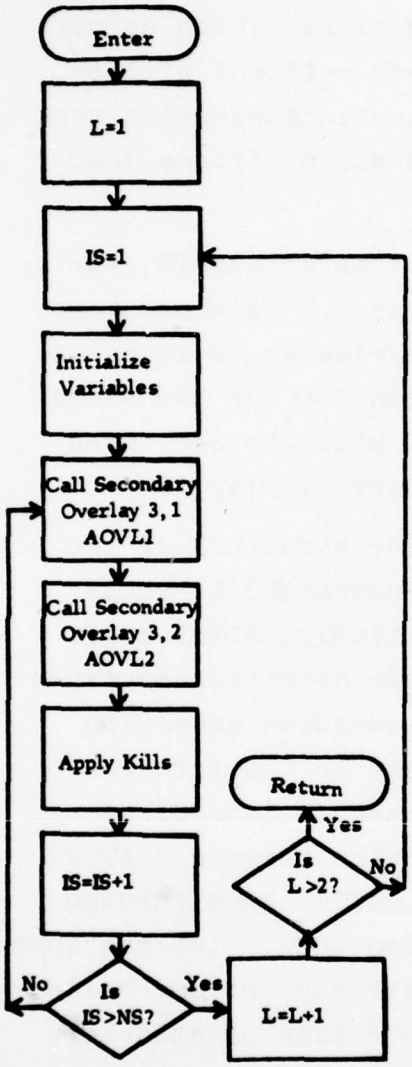


Figure 4. A FLOW CHART OF PRIMARY OVERLAY 3 AIRATT

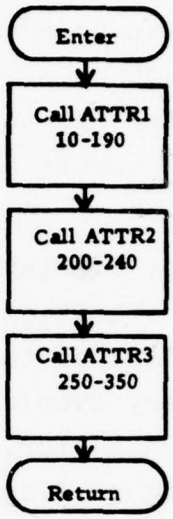


Figure 5. A FLOW CHART OF SECONDARY OVERLAY 3,1 AOVL1

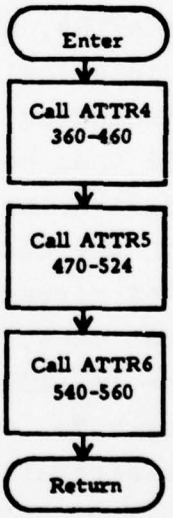


Figure 6. A FLOW CHART OF SECONDARY OVERLAY 3,2 AOVL2

numbered from 10 to 540 generally, but not always, in steps of 10. A shorthand list of these sections is given in Appendix B.

In most sections in the secondary overlays (see Sections 10-530, Appendix A), the inputs for an attrition subroutine are set up, the attrition subroutine is called, and the resulting attrition suffered is applied to the inventories. The interactions can be one of six types, and there is a separate attrition subroutine called to handle each type:

- ATRTSA is called when SAMs are opposing attackers and escorts.
- ATRTSS is called when SAMs are opposing SAM suppressors.
- ATRTDA is called when defending aircraft are opposing attackers and SAM suppressors.
- ATRTED is called when escorts are opposing defending aircraft.
- ATRTHS is called when helicopters are opposing SAMs.
- ATRTDH is called when defending aircraft are opposing helicopters.

ATRTSS, ATRTHS, and ATRTED allow the opposing forces to shoot at each other. ATRTSA allows the SAMs to shoot at the attackers and escorts, but these aircraft cannot shoot back. Likewise ATRTDH allows the defending aircraft to shoot at the helicopters but does not allow the helicopters to shoot back. ATRTDA allows the defenders to shoot at the attackers and SAM suppressors, but these aircraft can shoot back at the defenders only if they are shot at first.

ATRTSA, ATRTSS, ATRTED, and ATRTHS all use the same bionomial attrition equation which is in the subroutine BINOAT. The subroutine BINFAC is used by ATRTDA and ATRTDH. It is slightly different than BINOAT in that it computes the fraction of targets surviving as opposed to the absolute number of targets killed.

B. MACHINE CONVERSION

IDATAM is written in FORTRAN for a CDC 6400 computer with 150K octal core. It can be converted to other machines which have a FORTRAN compiler. However, some changes may be required. This chapter outlines parts of the program that may need to be changed in order to run IDATAM on machines other than CDC computers.

Conventions of the CDC 6400 computer require the first card of a program to be a PROGRAM card. All files are declared in the PROGRAM card of MAIN. IDATAM is broken into overlays. By CDC convention, the first routine in the overlay must have the characteristics of a FORTRAN main program (not a subroutine). Therefore, there is a PROGRAM card for each overlay or a total of seven PROGRAM cards. Overlays are defined by an OVERLAY card with the following format:

$$\text{OVERLAY}(\text{lfn},l_1,l_2)$$

where

lfn - the logical file name of the retention file, (i.e., IDATAM or ATTRTN)

l_1 - primary level number

l_2 - secondary level number.

Since there is an OVERLAY card for each overlay there are a total of seven OVERLAY cards. An overlay is called by the following statement:

$$\text{CALL OVERLAY}(\text{fn},l_1,l_2,\text{p})$$

where

fn - the logical file name of the retention file in left-justified hollerith code (i.e., 6HIDATAM, 6HATTRTN)

l_1 - primary level number

l_2 - secondary level number

p - recall parameter. If p equals 6HRECALL, the overlay is not reloaded if it is in memory.

There are six OVERLAY calls in MAIN, and two in AIRATT making a total of eight CALL OVERLAY cards. This makes a total of 22 cards (7 PROGRAM, 7 OVERLAY, and 8 CALL OVERLAY) which may need to be changed.

The input routine, INP, was designed to assist the user. As a result, the input formats are general and easily understood, but the routine itself is fairly complicated. There are three main concerns in INP in relation to machine conversion: ENCODE/DECODE statements, word size, and character conversion.

ENCODE/DECODE are statements which perform memory-to-memory transfer of data often called core-to-core I/O. The parameters are defined as follows:

ENCODE(c,n,v)L

where

c - unsigned integer constant or a simple integer variable (not subscripted) specifying the number of characters in the record; c may be an arbitrary number of BCD characters

n - statement number, variable identifier, or formal parameters representing the FORTRAN statement

v - variable or array identifier which supplies the starting location of the BCD record

L - input/output list.

The information in the list variables, L, is transmitted according to the FORMAT statement n and stored in locations starting at v, c, BCD characters per record.

DECODE(c,n,v)L .

The information in c consecutive BCD characters (starting at address v) is transmitted according to the FORMAT statement n and stored in the list variables.

The CDC 6400 computer has a 60 bit word, 6 bits per character making a 10 character word. Variables which need this character space will have to be declared large enough to handle up to 10 characters and be referenced accordingly.

As will be explained in Section C below, there is an option in the input routine that allows the user to increment or replace input data after any cycle. To implement this option there is a two-character cycle code in columns 19-20 of the input data cards. Cycles 0 through 99 are coded as required and blanks are converted to 0. If a simulation is longer than 99 days, day 100 is coded as A0, 101 as A1, 110 as B0, 197 as J7, etc. This two character code is read in A format and converted to a numeric value in machine dependent code. Alphanumeric characters are assumed to have the following values:

Character	Octal Code	Character	Octal Code
A	01	0	33
B	02	1	34
C	03	2	35
.	.	.	.
.	.	.	.
.	.	.	.
Z	32	9	44

It should be easy to make this conversion for any machine.

C. PREPARATION OF INPUTS

There are two consecutive groups of data which are read in as inputs. The first is an alphabetically ordered deck of definitions of the input variables. The second group of data consists of the values of the input variables. Each deck is followed by a card with "ZZZZZZ" in the first six columns as a delimiter.

The definition of the input deck should not change unless an input's definition is altered. The format of the cards in this deck is:

Card Column	Contents
1-6	Input variables name (left justified)
7	Sequence number of card (1-5)
8-77	Definition of the input variable.

Up to five cards may be used per definition and the sequence number must have the value one through five.

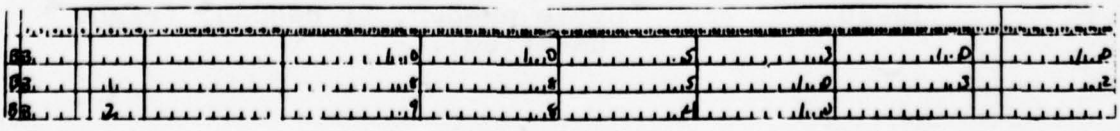
The card format for the second deck is:

Card Column	Contents
1-6	Input variables name (left justified)
7-8	Continuation code
9	Not used
10-12	First argument, if needed, (right justified)
13-15	Second argument, if needed, (right justified)
16-18	Third argument, if needed, (right justified)
19-20	Cycle number, if needed, (right justified).

Card Column	Contents
21-30	Data field 1
31-40	Data field 2
41-50	Data field 3
51-60	Data field 4
61-70	Data field 5
71-80	Data field 6

There are six ten-character data fields (columns 21-80) for actual data values. All inputs follow the standard FORTRAN typing rule (i.e., names beginning with I-N are integer, and otherwise are assumed to be real). Floating point numbers are read in with an F10.0 format. This means a decimal point must appear in the field if the input value has a fractional part. Integers are read in with an I10 format and must be right justified. There are also four alphanumeric variables, AACT, AAMT, ALRS, and AMRS, whose values are read in with an A10 format.

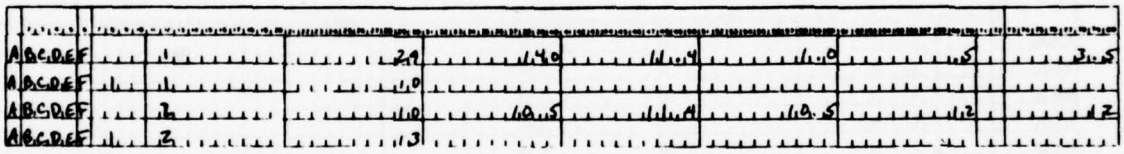
The first, second, and third arguments are used to indicate how the data are to be stored. For example, assume input values are to be coded for a one-dimensional array, BB, dimensioned to 16. Three cards are required. The first card contains BB in columns 1 and 2, either a blank or 0 in column 8, and the data values for BB(1) through BB(6) in the six data fields. The second card contains the variable name, a "1" in column 8, and has values for locations BB(7) through BB(12). The third card contains the variable name, a "2" in column 8, and has values for locations 13-16 of BB.



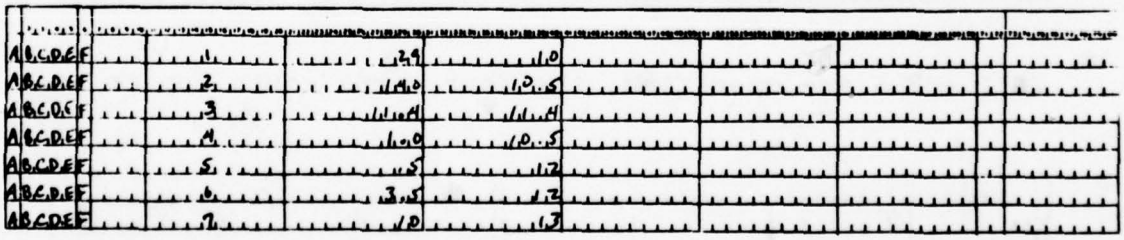
Assume input is required for an array ABCDEF(2,7) with the following values:

		Column						
		1	2	3	4	5	6	7
Row	1	29	140	11.4	1.0	0.5	3.5	10
	2	10	10.5	11.4	10.5	12	12	13

The coding can be done in two ways. The first way is to enter the data in rows. Specify the variable name, the first argument, I=1, and enter 6 values on the first card, followed by a second card with the variable name, a "1" in column 8, I=1, and a single value. Then repeat the above for I=2.



The second method is to specify the second argument, J=1, on a card and provide two values; repeat for J=1 through 7.

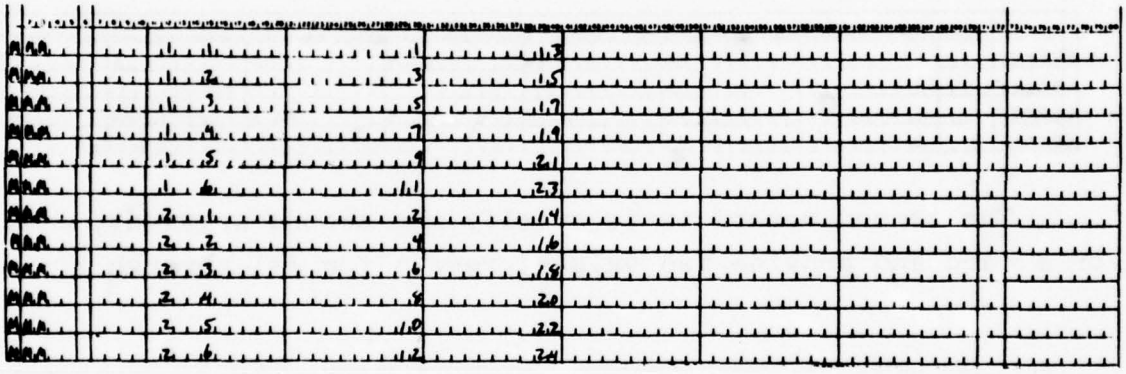


The latter method enters the data by columns. For this example, the first method requires fewer cards, but the user may find the second method easier to read, verify, and if necessary, change.

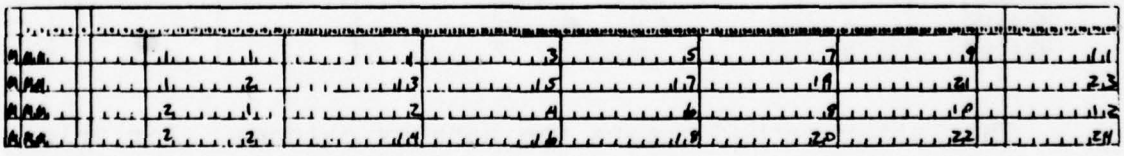
Next, assume input is required for array MMM(2,6,2) with the values:

				Column					
				1	2	3	4	5	6
Plane	1	Row	1	1	3	5	7	9	11
			2	2	4	6	8	10	12
	2	Row	1	13	15	17	19	21	23
			2	14	16	18	20	22	24

In this case three methods are available. Either specify arguments I and J, J and K, or I and K. The first two methods will require twelve cards, whereas the third method will require four cards. If I and J are specified, the twelve cards would appear as:



If I and K are specified, the four cards would appear as:



Once an input deck has been set up, the user may wish to make variations by changing the values for some of the input variables. One way to do this without having to delete the original card(s) is to place the card(s) with the updated

value(s) anywhere after the original card(s), but before the input cards for the next cycle. For cycle zero, the program simply accepts the last input value. The same principal holds for replacement variables for cycles beyond cycle zero. However, all cards for incremental variables are processed after cycle zero.

For example, if it is desired to change the fourth element of array BB to 10.0, the original card could be retyped with 10.0 in the fourth data field, or an additional card could be inserted anywhere after the original cards. This card would contain "BB" in columns 1 and 2, a "4" in column 12, and the value "10.0" in data field 1, columns 21-30. This latter method may be convenient if there are many changes to be made.

Input variables can be updated after any cycle. The cycle number is in card columns 19-20. As explained at the end of Section B above, cycles zero through ninety-nine are represented by the numbers 0 through 99, with 0 or a blank representing cycle 0. If the simulation is to be run longer than 99 cycles, A0 represents 100 cycles, A1 represents 101, B0 represents 110 cycles, J7 represents 197 cycles, etc. Cards in this deck must be in ascending order of cycles. Some input variables are incremented (see Appendix C, Incremental Variables) by the values in the data fields; all other input values are replaced by the new values.

The program is now dimensioned so that the upper bound on the following variables are:

NAC	(maximum number of types of aircraft)	15
NAM	(maximum number of types of air munitions)	10
NLS	(maximum number of types of long range SAMs/HIMADS)	3
NMS	(maximum number of types of medium range SAMs/SHORADS)	6
NQRAT	(maximum number of types of QRA aircraft)	7
NS	(maximum number of sectors)	2

These variables can be increased provided that all the appropriate COMMON and DIMENSION statements are changed, and that the program will still fit into core.

There are no internal checks made on the consistency of inputs. For instance, there will be problems if the variables listed in Appendix D are zero. Care should also be taken when preparing the variables which involve the allocations of aircraft.

D. DESCRIPTION OF OUTPUTS

There are three types of output that can be printed: a listing of the inputs, summary output tables, and detailed printouts. INP automatically prints out an alphabetical listing of the input variables, their definitions, their values for cycle 0, and a listing of inputs and their values which are to be updated, if any, in later cycles. PSAIR, the print summary routine, prints out the following 21 summary tables.

Table No.	Description	Table No.	Description
1	Undamaged Blue aircraft, QRA, and helicopters in theater at end of cycle, by type and location.	11	Cumulative Blue aircraft by type killed in air by mission and helicopters killed in air.
2	Undamaged Red aircraft, QRA, and helicopters in theater at end of cycle, by type and location.	12	Cumulative Red aircraft by type killed in air by mission and helicopters killed in air.
3	Damaged Blue aircraft, by type and location, and aircraft by type in repair and replacement pools at end of cycle.	13	Cumulative Blue undamaged, damaged, and QRA aircraft killed on ground by type and location.
4	Damaged Red aircraft by type and location and aircraft by type in repair and replacement pools at end of cycle.	14	Cumulative Red aircraft killed on ground by type and location.
5	Undamaged Blue SAMs by type and location in theater at end of cycle.	15	Cumulative aircraft by type and helicopters damaged and repaired, and aircraft converted to QRA by type and location.
6	Undamaged Red SAMs by type and location in theater at end of cycle.	16	Cumulative successful attack sorties by aircraft type and target.
7	SAMs by type in repair and replacement pools, and total number of missiles in theater at end of cycle for each SAM type.	17	Cumulative Blue SAMs by type and location killed in theater at end of cycle.
8	Air munitions by type expended on CAS and INTD, and operational and destroyed aircraft shelters by location.	18	Cumulative Red SAMs by type and location killed in theater at end of cycle.
9	Cumulative Blue sorties attempted by mission and aircraft type.	19	SAMs by type suppressed during cycle, and cumulative SAMs by type damaged and repaired.
10	Cumulative Red sorties attempted by mission and aircraft type.	20	Cumulative aircraft by type killed or damaged in air by class of shooter.
		21	Selected measures of effectiveness.

The first seven summary tables are printed automatically for cycle zero. All summary tables are also printed automatically after the first cycle, the last cycle, and whenever a detailed printout is requested. Summary tables for up to 30 additional cycles can be directly requested through an input variable, IPRSO (see Description of Variables for more detail).

A sample output of IDATAM (giving all 21 summary tables for one cycle) is given in Appendix G.

A detailed printout is a listing of the values of working variables used in each section, for each side and sector. (Sections are defined in Appendix A.) The detailed print is used for debugging and for tracing the logic of the program through each set of computations. Detailed prints are requested through IPRDO, another input variable.

REFERENCES

1. L.B. Anderson, D. Bennett, M.J. Hutzler, *Modifications to IDAGAM I,* IDA Paper P-1034, Institute for Defense Analyses, Arlington, VA., October 1974.

2. L.B. Anderson, J. Bracken, J.G. Healy, M.J. Hutzler, E.P. Kerlin, *IDA Ground-Air Model I (IDAGAM I),* Volume 1: *Comprehensive Description;* Volume 2: *Definitions of Variables;* Volume 3: *Detailed Description of Selected Portions;* Volume 4: *Documentation;* and Volume 5: *Testing;* (Secret), IDA Report R-199, Institute for Defense Analyses, Arlington, VA., October 1974.

APPENDIX A

DESCRIPTION OF SECTIONS

DESCRIPTION OF SECTIONS

For ease in reading and understanding the computer program, primary overlays 2, 3, and 4 of the IDATAM code are divided by comment statements into modular sections. These sections have no direct bearing on the computer-related structure of the code (other than that detailed prints, if requested, are made after each section), but they can be very useful as a guide to where various calculations are made in the model. These sections are numbered generally, but not always, in steps of ten. Note that ALLOCT and ATTR1 are in different overlays, so there is no harm in using some of the same section numbers in these routines (which IDATAM does, as is indicated below).

The following is a list of these sections giving the routine (overlay or subroutine) that each is in, the subroutine (if any) that each calls, and the action each contains. This listing, along with the shortened version given in Appendix B, is helpful when working with a detailed printout.

Routine	Section	Subroutine	Action
ALLOCT	100		Compute weighted number of target aircraft on each notional airbase.
	110		Compute communications zone area aircraft assignments.
	120		Compute rear area aircraft assignments.
	130		Compute forward area aircraft assignments.
	140		Compute number of sorties for each mission.

Routine	Section	Subroutine	Action
	150		Compute air munition load factors to account for distance and compute air munitions expended by type.
AIRATT	5		Initialize working variables.
	570		Apply SAM kills and damages to SAM inventories.
ATTR1	10	ATRTED	Compute attrition of close air support escorts vs. close air support defenders.
	15	ATRTSS	Compute attrition of belt SAM suppressors vs. point medium range SAM in combat.
	20	ATRTSA	Compute attrition of fly-by attackers vs. medium range SAM.
	30	ATRTSS	Compute attrition of belt SAM suppressors vs. belt long range SAMs.
	50	ATRTED	Compute attrition of forward, rear, and communications zone airbase attack (and interdiction) vs. close air support defender.
	60	ATRTDA	Compute attrition of forward, rear, and communications zone airbase attack and interdiction attackers plus forward, rear, and communications zone airbase attack and interdiction SAM suppressors vs. close air support defender.
	70	ATRTSS	Compute attrition of forward, rear, and communications zone airbase attack and interdiction SAM suppressors vs. belt long range SAMs.
	80	ATRTSA	Compute attrition of forward, rear, and communications zone airbase attack and interdiction attackers plus forward, rear, and communications zone airbase attack and interdiction escorts vs. belt long range SAMs.

Routine	Section	Subroutine	Action
	90	ATRTED	Compute attrition of forward, rear, and communications zone airbase attack and interdiction escorts vs. forward airbase attack defenders.
	100	ATRTDA	Compute attrition of forward, rear, and communications zone airbase attack and interdiction attackers and SAM suppressors plus forward airbase attack defenders.
	110	ATRTSS	Compute attrition of forward, rear, and communications zone airbase attack and interdiction SAM suppressors vs. forward area long range SAMs.
	120	ATRTSS	Compute attrition of forward, rear, and communications zone airbase attack and interdiction SAM suppressors vs. forward area medium range SAMs.
	130	ATRTSA	Compute attrition of forward, rear, and communications zone airbase attack and interdiction attackers plus rear and communication zone airbase attack escorts vs. forward area long range SAMs.
	140	ATRTSA	Compute attrition of forward, rear, and communications zone airbase attack and interdiction attackers plus rear and communication zone airbase attack escorts vs. forward area medium range SAMs
	150	ATRTSS	Compute attrition of forward airbase attack SAM suppressors vs. forward point medium range SAMs.
	170	ATRTSA	Compute attrition of forward airbase attack aircraft vs. forward point medium range SAMs.
	190		Airbase attack aircraft deliver ordnance to forward airbases.

Routine	Section	Subroutine	Action
	200	ATRTSS	Compute attrition of interdiction SAM suppressors vs. point medium range SAMs in interdiction.
	220	ATRTSA	Compute attrition of interdiction attackers vs. point medium range SAMs in interdiction.
	240		Interdiction attackers deliver ordnance to interdiction targets.
	250	ATRTED	Compute attrition of rear and communications zone airbase attack escorts vs. rear airbase attack defenders.
	260	ATRTDA	Compute attrition of rear and communications zone airbase attack attackers and SAM suppressors vs. rear airbase attack defenders.
	270	ATRTSS	Compute attrition of rear and communications zone airbase attack SAM suppressors vs. rear area long range SAMs.
	280	ATRTSS	Compute attrition of rear and communications zone airbase attack SAM suppressors vs. rear area medium range SAMs.
	290	ATRTSA	Compute attrition of rear and communications zone airbase attack aircraft plus communications zone airbase attack escorts vs. rear area long range SAMs.
	300	ATRTSA	Compute attrition of rear and communications zone airbase attack aircraft plus communications zone airbase attack escorts vs. rear area medium range SAMs.
	310	ATRTSS	Compute attrition of rear airbase attack SAM suppressors vs. rear point medium range SAMs.
	330	ATRTSA	Compute attrition of rear airbase attack aircraft vs. rear point medium range SAMs.

Routine	Section	Subroutine	Action
	350		Airbase attack aircraft deliver ordnance to rear airbases.
ATTR4	360	ATRTED	Compute attrition of communications zone airbase attack escorts vs. airbase attack defenders in communications zone.
	370	ATRTDA	Compute attrition of communications zone airbase attack aircraft and SAM suppressors vs. airbase attack defenders in communications zone.
	380	ATRTSS	Compute attrition of communications zone airbase attack SAM suppressors vs. area long range SAMs in communications zone.
	390	ATRTSS	Compute attrition of communications zone airbase attack SAM suppressors vs. area medium range SAMs in communications zone.
	400	ATRTSA	Compute attrition of communications zone airbase attack aircraft vs. area long range SAMs in communications zone.
	410	ATRTSA	Compute attrition of communications zone airbase attack aircraft vs. area medium range SAMs in communications zone.
	420	ATRTSS	Compute attrition of communications zone airbase attack SAM suppressors vs. point medium range SAMs in communications zone.
	440	ATRTSA	Compute attrition of communications zone airbase attack aircraft vs. point medium range SAMs in communications zone.
	460		Airbase attack aircraft deliver ordnance to airbases in communications zone.

Routine	Section	Subroutine	Action
ATTR5	470	ATRTSA	Compute attrition of close air support attackers and close air support SAM suppressors vs. belt long range SAMs.
	480	ATRTDA	Compute attrition of close air support attackers and close air support SAM suppressors vs. close air support defenders.
	490	ATRTSS	Compute attrition of close air support SAM suppressors vs. point medium range SAMs in combat.
	510	ATRTSA	Compute attrition of close air support attackers vs. point medium range SAMs in combat.
	522	ATRTDH	Compute attrition of helicopters vs. close air support defenders.
	524	ATRTHS	Compute attrition of helicopters vs. point medium range SAMs in combat.
	530		Close air support attackers deliver ordnance to close air support targets.
ATTR6	540	ATRTWH	Compute attrition on the way home for all attacker aircraft.
	550		Convert sorties to aircraft.
	560		Parcel out aircraft killed and damaged in air.
AIRGRD	580		Apply kills and damages in air to aircraft inventories.
	590		Calculate number of sheltered and nonsheltered aircraft on forward airbases.
	600	AIRTAB	Compute attrition on ground due to airbase attacks against forward airbases.

Routine	Section	Subroutine	Action
	610		Calculate number of sheltered and nonsheltered aircraft on rear airbases.
	620	AIRTAB	Compute attrition on ground due to airbase attacks against rear airbases.
	630		Calculate the number of sheltered and nonsheltered aircraft on communications zone airbases.
	640		Compute aircraft remaining.
	650	QRAFIL	Convert aircraft to QRA aircraft to fill QRA short fall.
	660	CVFW	Compute value of air munitions delivered.
	665		Repair runways.
	670		Move aircraft from replacement pool to airbases.
	680		Move SAMs from replacement pool to operational units.
	690		Move helicopters from replacement pool to operational units.
	700		Repair damaged aircraft on airbases and in repair pool.
	710		Repair damaged SAMs and helicopters.
	720		Compute aggregated measures of effectiveness.

APPENDIX B

INTERACTIONS (LESS ABA AIR-TO-GROUND)

INTERACTIONS (LESS ABA AIR-TO-GROUND)

This appendix gives a shorthand list of the air-to-air, ground-to-air, and air-to-ground (less airbase attack) interactions. This shorthand list is relatively cryptic and should be omitted on first reading (Appendix A should be consulted instead). However, as a user of IDATAM becomes familiar with the model, this list can become quite useful as a table of contents for overlay 3.

This shorthand list gives (by section) the attacker, the opposing defender, and indicates who may possibly suffer attrition. The following three codes are used:

A ←—— D	**defenders shoot at attackers.**
A ←——→ D	**attackers and defenders shoot at each other.**
A ←——□ D	**defenders shoot, attackers shoot back only if shot at.**

Sections 90-190 include all the listed attackers, but only the forward defenders. Sections 250-350 include all but the forward attackers and only the rear defenders. Sections 360-460 include only the communications zone attackers and only the communications zone defenders.

Section	Attacker		Defender
10	CASE	⟷	CASD
15	BSSUP	⟷	PMRSC
20	ABA(A, S)(F, R, Z), INTD(A, S)	⟵	PMRSC
30	BSSUP	⟵□	CASD
40	BSSUP	⟷	BLRS
50	ABAE(F, R, Z), INTDE	⟷	CASD
60	ABA(A, S)(F, R, Z), INTD(A, S)	⟵□	CASD
70	ABAS(F, R, Z), INTDS	⟵□	BLRS
80	ABA(A, E)(F, R, Z), INTD(A, E)	⟵	BLRS
90(250, 360)	ABAE(F, R, Z), INTDE	⟷	ABDF, R, Z
100(260, 370)	ABA(A, S)(F, R, Z), INTD(A, S)	⟵□	ABDF, R, Z
110(270, 380)	ABAS(F, R, Z), INTDS	⟷	ALRSF, R, Z
120(280, 390)	ABAS(F, R, Z), INTDS	⟷	AMRSF, R, Z
130(290, 400)	ABAA(F, R, Z), ABAE(R, Z), INTDA	⟵	ALRSF, R, Z
140(300, 410)	ABAA(F, R, Z), ABAE(R, Z), INTDA	⟵	AMRSF, R, Z
150(310, 420)	ABASF, R, Z	⟷	PMRSF, R, Z
170(330, 440)	ABAAF, R, Z	⟵	PMRSF, R, Z
190(350, 460)	ABAAF, R, Z Delivers Ordnance		
200	INTDS	⟷	PMRSI
220	INTDA	⟵	PMRSI
240	INTDA Delivers Ordnance		
470	CAS(A, S)	⟵	BLRS
480	CAS(A, S)	⟵□	CASD
490	CASS	⟷	PMRSC
510	CASA	⟵	PMRSC
522	HELI	⟵	CASD
524	HELI	⟷	PMRSC
526	HELI Delivers Ordnance		
530	CASA Delivers Ordnance		
540	Attrition on the Way Home		

APPENDIX C

INCREMENTAL INPUT VARIABLES

INCREMENTAL INPUT VARIABLES[1]

The following variables are currently defined in the program as incremental input variables, that is, if any of these variables are updated (excluding cycle 0), the variable will be incremented by the value on the TIMET card. All other variables in the program are replacement input variables and so are not specifically listed. Note: if a variable is updated after a cycle, then the summary tables for that and succeeding cycles will reflect the change.

ACFS(IAC,IS,L)
ACRS(IAC,IS,L)
ACCZ(IAC,L)
ACFSDM(IAC,IS,L)
ACRSDM(IAC,IS,L)
ACCZDM(IAC,L)
ALRSF(ILS,IS,L)
ALRSR(ILS,IS,L)
ALRSZ(ILS,L)
AMRSF(IMS,IS,L)
AMRSR(IMS,IS,L)
AMRSZ(IMS,L)
AMTLRS(ILS,L)
AMTMRS(IMS,L)
BLRS(ILS,IS,L)
DAMPL(IAC,L)
DLSMPL(ILS,L)
DMSMPL(IMS,L)
DHMPL(L)
HELI(IS,L)
PMRSC(IMS,IS,L)
PMRSF(IMS,IS,L)
PMRSI(IMS,IS,L)
PMRSR(IMS,IS,L)
PMRSZ(IMS,L)
QRAFS(J,IS,L)
QRARS(J,IS,L)
QRACZ(J,L)
REPLA(IAC,L)
REPLH(L)
REPLLS(ILS,L)
REPLMS(IMS,L)
SACFRB(IS,I,L)
SACZB(L)

[1]For definitions of these variables see Appendix H.

APPENDIX D

INPUT VARIABLES WHICH SHOULD NOT BE ZERO

INPUT VARIABLES WHICH SHOULD NOT BE ZERO[1]

For various reasons the following input variables should not be zero:

ABASEF	NLS
ABASER	NMS
ABASEZ	NQRAT
FABASS	NS
FCASSS	NVAMCF
FINDSS	NVAMQF
IABAAG	PENCOR
IQRAP	RSMIN
IRAC	WCACAS
NAC	WCOR
NAM	WIDS

[1]For definitions of these variables see Appendix H.

APPENDIX E

OVERLAYS, FILES, PROGRAMS, AND SUBROUTINES

OVERLAYS, FILES, PROGRAMS, AND SUBROUTINES

Below is a cross-reference of all overlays, files, programs, and subroutines. An overlay is a portion of a program which is stored in reloadable form on a file, either IDATAM or ATTRTN. A brief description of the programs and subroutines contained in each overlay is given:

Overlay Level	File Name	Program Name	Subroutine Name	Description
MAIN	IDATAM	MAIN		Program generator.
			TIMET	Updates data values throughout the war.
PRIMARY	IDATAM	TZERO(1,0)		Calls INP and INIT.
			INIT	Initialization routine.
			INP	Input routine.
PRIMARY	IDATAM	ALLOCT(2,0)		Computes fractional aircraft allocations.
PRIMARY	ATTRTN	AIRATT(3,0)		Air-to-air attrition.
			ATRTSS	Computes attrition of SAM suppressors vs. SAMs.
			ATRTDA	Computes attrition of defenders vs. attacks and SAM suppressors.
			ATRTSA	Computes attrition of SAMs vs. attackers and escorts.
			ATRTED	Computes attrition of escorts vs. defenders.

Overlay Level	File Name	Program Name	Subroutine Name	Description
			BINOAT	Binomial attrition routine.
			BINFAC	Binomial factor routine.
SECONDARY	ATTRTN	AOVL1(3,1)		Calls ATTR1, ATTR2, and ATTR3.
			ATTR1	Sets up interactions and calls attrition routines.
			ATTR2	Sets up interactions and calls attrition routines.
			ATTR3	Sets up interactions and calls attrition routines.
SECONDARY	ATTRTN	AOVL2(3,2)		Calls ATTR4, ATTR5, and ATTR6.
			ATTR4	Sets up interactions and calls attrition routines.
			ATTR5	Sets up interactions and calls attrition routines.
			ATTR6	Sets up interactions and calls attrition routines.
			ATRTWH	Computes attrition of aircraft going home.
			ATRTDH	Computes attrition of defenders vs. helicopters.
			ATRTHS	Computes attrition of helicopters vs. SAMs.
PRIMARY	IDATAM	AIRGRD(4,0)		Computes attrition of aircraft due to airbase attack.
			ATRTAB	Computes attrition on airbases.
			CVFW	Interpolation of value of CAS sorties.

Overlay Level	File Name	Program Name	Subroutine Name	Description
			QRAFIL	Handles QRA distribution.
PRIMARY	IDATAM	PSAIR(5,0)		Print summary routine.

APPENDIX F

PROCEDURE FOR ALTERING THE LIST OF INPUT VARIABLES

PROCEDURE FOR ALTERING THE LIST OF INPUT VARIABLES

This appendix is only for the user who wishes to add, delete, or redimension input variables in the model. The data decks for IDATAM are relatively easy to prepare. However, the input routine, INP, which processes these decks is fairly complex. To allow the user the convenience of a simplified input scheme, a cross reference map of the input variables, which are defined in blank common, is used in INP. The cross reference map, IVARQ, is keyed on the input variable name. If blank common is to be changed, IVARQ must be updated to reflect the change. IVARQ is defined by a set of DATA statements. An independent program named COMM is used to recreate the DATA statements when COMMON is changed. A run to change a statement in COMMON from "COMMON BLRS(3,2,2)" to "COMMON BLRS(4,2,2)" might appear as:

Card No.	Card	Description of Action
1	JOB CARD	Job identifier, request 150K.
2	REQUEST(OLDPL,HI)Ø(0001/FP)	Request tape which contains program.
3	NUPDATE(N=PL)	Update COMMON (cards 21-23).
4	RETURN OLDPL	Returns OLDPL.
5	NUPDATE(Q,P=PL)	Copy updated COMMON onto TAPE 10 (cards 25-27).[1]
6	FTN.	Compile Program COMM (noted card 29).

[1]See the text following this example for a specification of TAPE 10.

Card No.	Card	Description of Action
7	LGO.	Load and execute Program COMM (data noted card 21)(decreases field length).
8	REWIND,TAPE15.	Rewind tape 15 for later processing.
9	RFL,150000.	Increase field length to 150K.
10	REQUEST(NEWPL,HI)Ø(SAVE)	Request a save tape named NEWPL.
11	NUPDATE(N,F,R=C,P=PL)	Do update (cards 33-35) to create a new program on NEWPL.
12	REWIND LGO.	Rewind the load file.
13	FTN(I=COMPILE,A,T,R=3)	Compile program to create load file, LGO.
14	REQUEST(BIN,HI)Ø(SAVE)	Request a save tape named BIN.
15	REWIND,LGO	Rewind the load file.
16	COPBF(LGO,BIN)	Copy LGO onto BIN.
17	REWIND,LGO.	Rewind load file.
18	CLEAR	Zero out memory.
19	LGO.	Load and execute program, IDATAM.
		NOTE:End of Control Stream
20	7/8/9	Delimiter.
21	*IDENT COMCHG.1	Arbitrary identifier for NUPDATE.[1]
22	*DELETE COMM.13	Delete the old COMMON card, COMMON BLRS(3,2,2).[2]
23	COMMON BLRS(4,2,2)[3]	Insert the new card in COMMON.

[1]COMCHG.1 is the example identifier used here.

[2]COMM.13 is assumed to specify the card COMMON BLRS(3,2,2) in this example.

[3]This card starts in column 7.

Card No.	Card	Description of Action
24	7/8/9	Delimiter.
25	*IDENT COPY1	Arbitrary identifier for NUPDATE.[4]
26	*COMPILE COMM[5]	Compile COMMON.
27	*COPY COMM,COMM.2, CHG13.21,TAPE10	Copy updated COMMON onto TAPE10.[6]
28	7/8/9	Delimiter.
29s	PROGRAM COMM[7]	Create new data statements on TAPE15 from TAPE10.
30	7/8/9	Delimiter.
31s	DATA FOR PROGRAM COMM[8]	Exceptions to type rule.[8]
32	7/8/9	Delimiter.
33	*IDENT DSTMT2[9]	Arbitrary identifier for NUPDATE.
34	*YANK DSTMT1[9]	Delete old data statements.
35	*INSERT CHG18.6[10]	Insert new data statements.
36	*READ TAPE15	Read the data statements from TAPE15.
37	7/8/9	Delimiter.
38	IDATAM DATA DECKS	Definitions and values.
39	6/7/8/9	Delimiter.

[5]COMM refers to a deck, not a Program here.

[6]COMM.2 and CHG13.21 are assumed to include all of the inputs and nothing else.

[7]The FORTRAN deck of cards which is PROGRAM COMM goes here.

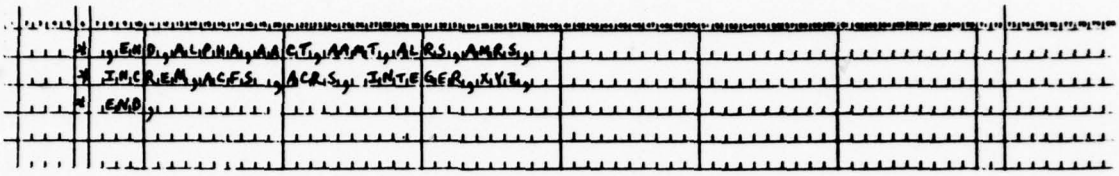
[8]The required cards which give the data for PROGRAM COMM go here--see the text which follows for the definition of "exceptions to type rule."

[9]This assumes that the old data statements were all identified by DSTMT1 and that the new set of data statements is to be identified by DSTMT2.

[10]This assumes that the identifier of the card just before the old data statements (i.e., just before DSTMT1.1) is CHG18.6.

This input scheme uses NUPDATE, a program maintenance routine, to update IDATAM. If your system does not support a program maintenance routine, change program COMM to punch the new data statements and insert them by hand.

The data input to program COMM is the COMMON deck (assumed to reside on TAPE10) followed by exceptions noted on cards in the data deck. The exceptions to be noted are with respect to the "typing of variables" and the updating of input variables in TIMET. The conventions for typing of variables is the standard for FORTRAN, i.e., names beginning with I-N are integer, and otherwise assumed real. If a variable contains alphanumeric information, it must be noted as "ALPHA". If a variable is to be accepted as real when it begins with I-N, it must be noted as "REAL". Similarly, a variable that does not begin with I-N (but is typed integer) must be noted as "INTEGER". Processing a variable at time t is always assumed to be "replacement". If the variable is to be incremented, it must be noted as "INCREM". If a variable is to be treated as "side-implicit" it should be noted as "BLURED". (Note: the TACWAR model, currently being developed at IDA, uses this option, IDATAM does not.) Following an end of file on TAPE10, input for variable types is expected from the system's card reader. This input is free format in columns 6-72. Column 6 is any non-blank character denoting continuation. The first string of characters to be input is ",END," to terminate the reading of COMMON. Exceptions are then input as strings such as "OPER,V_1,V_2,...,V_n". OPER can have the values ALPHA, INTEGER, REAL, INCREM, or BLURED. The values of V_1 are variable names. The exceptions are terminated by the string "END,". The following may be a helpful example:



No exceptions need be included.

APPENDIX G

SAMPLE OUTPUT

SAMPLE OUTPUT

This appendix gives an example of each of the 21 summary output tables discussed in Chapter II, Section D. As stated in that section, these tables are automatically printed out after certain cycles and can be requested after any cycle. Note that these tables are printed after all the combat interactions have occurred and after all "time-t" force level updates for the cycle in question have been applied. Thus, the force levels printed on Tables 1 through 7 are those levels which will be used for the next cycle. In the example given here, these tables were printed after the first cycle.

This example is based on unclassified and entirely hypothetical data.

TABLE 1 CYCLE 1 BLUE AIRCRAFT(UNDAMAGED), QRA, AND HELICOPTERS IN THEATER AT END OF CYCLE

	UNDAMAGED AIRCRAFT LOCATION					
AIRCRAFT	COMMZ	REAR-1	FORWARD-1	REAR-2	FORWARD-2	THEATER TOTALS
F-104	0.00	394.44	378.57	98.28	61.77	933.05
A-7	98.92	49.27	41.34	49.37	48.17	286.07
F-4	98.42	191.50	181.12	481.91	466.40	1419.35
F-111	98.66	0.00	0.00	98.49	98.10	295.24
TOTALS	295.19	635.20	601.03	728.04	674.45	2933.92
QRA						
F-4	0.00	.00	2.89	.00	1.84	4.73
F-111	200.00	0.00	47.11	0.00	48.16	295.27
TOTALS	200.00	.00	50.00	.00	50.00	300.00
HELICOPTERS (IN COMBAT SECTORS)			280.59		283.93	564.52

TABLE 2 CYCLE 1 MFD AIRCRAFT(UNDAMAGED), QRA, AND HELICOPTERS IN THEATER AT END OF CYCLE

	UNDAMAGED AIRCRAFT LOCATION					
AIRCRAFT	COMMZ	REAR-1	FORWARD-1	REAR-2	FORWARD-2	THEATER TOTALS
MIG-21	97.67	388.32	765.75	388.39	729.17	2369.30
SU- 7	98.40	96.62	96.62	0.00	96.30	388.14
MIG-23	98.22	97.98	97.63	97.59	96.95	488.38
BADGER	92.11	91.49	87.99	92.03	73.20	436.83
TOTALS	386.60	674.41	1047.99	578.01	995.63	3680.65
QRA						
BADGER	0.00	0.00	100.00	0.00	100.00	200.00
TOTALS	0.00	0.00	100.00	0.00	100.00	200.00
HELICOPTERS (IN COMBAT SECTORS)			0.00		0.00	0.00

TABLE 3 CYCLE 1 BLUE DAMAGED AIRCRAFT AND AIRCRAFT IN REPAIR AND REPLACEMENT POOLS AT END OF CYCLE

DAMAGED AIRCRAFT LOCATION

AIRCRAFT	COMM2	REAR=1	FORWARD=1	REAR=2	FORWARD=2	TOTALS
F-104	0.00	.97	.50	.24	.05	1.77
A-7	.22	.07	.07	.05	.02	.43
F-4	.88	1.06	1.00	2.19	.90	6.03
F-111	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS	1.10	2.10	1.56	2.49	.98	8.23

AIRCRAFT IN REPAIR AND REPLACEMENT POOLS

AIRCRAFT	REPAIR POOL	REPLACEMENT POOL	DAM/UNDAM AIRCRAFT	GRAND TOTAL
F-104	.67	100.00	935.	1035.
A-7	.25	30.00	294.	324.
F-4	6.65	150.00	1426.	1582.
F-111	.93	30.00	293.	324.
TOTALS	8.50	310.00	2947.	3266.
HELICOPTERS	3.47	60.00	565.	628.

TOTAL WRA AIRCRAFT	TOTAL AIRCRAFT
300.	3566.

TABLE 4 CYCLE 1 MED DAMAGED AIRCRAFT AND AIRCRAFT IN REPAIR AND REPLACEMENT POOLS AT END OF CYCLE

DAMAGED AIRCRAFT LOCATION

AIRCRAFT	COMMZ	REAR-1	FORWARD-1	REAR-2	FORWARD-2	TOTALS
MIG-21	.53	2.64	2.86	2.65	2.68	11.37
SU- 7	.92	.45	.44	0.00	.42	2.22
MIG-23	.34	.19	.22	.22	.23	1.20
BADGER	0.00	0.00	2.08	0.00	1.86	3.94
TOTALS	1.79	3.28	5.60	2.87	4.19	17.74

AIRCRAFT IN REPAIR AND REPLACEMENT POOLS

AIRCRAFT	REPAIR POOL	REPLACEMENT POOL	DAM/UNDAM AIRCRAFT	GRAND TOTAL
MIG-21	5.96	25.00	2381.	2412.
SU- 7	1.37	0.00	388.	390.
MIG-23	.90	0.00	490.	490.
BADGER	6.32	0.00	441.	447.
TOTALS	14.55	25.00	3699.	3739.
HELICOPTERS	0.00	0.00	0.	0.

TOTAL UNA AIRCRAFT 200.

TOTAL AIRCRAFT 3939.

TABLE 5 CYCLE 1 BLUE SAMS (UNDAMAGED) IN THEATER AT END OF CYCLE F

LOCATION

	AREA COMMZ	AREA REAR-1	AREA FORWARD-1	BELT 1	AREA REAR-2	AREA FORWARD-2	BELT 2	THEATER TOTAL (OPERATIONAL)
LONG-RANGE SAMS								
HERCULES	1.00	1.00	.99	1.94	1.00	.99	1.97	9.
HAWK	1.00	0.00	0.00	3.88	1.00	.99	1.97	9.
SUBTOTAL	2.00	1.00	.99	5.82	2.00	1.98	3.94	18.
MID-RANGE SAMS								
CHAPARAL	0.00	0.00	59.55	-----	0.00	59.70	-----	119.
SUBTOTAL	0.00	0.00	59.55	-----	0.00	59.70	-----	119.
TOTAL	2.00	1.00	60.54	5.82	2.00	61.68	3.94	137.

	POINT COMMZ	POINT REAR-1	POINT FORWARD-1	POINT INTD-1	POINT COMBAT-1	POINT REAR-2	POINT FORWARD-2	POINT INTD-2	POINT COMBAT-2	THEATER TOTAL (OPERATIONAL)
MID-RANGE SAMS										
CHAPARAL	0.00	19.98	19.51	9.99	99.30	19.98	19.57	90.61	99.50	487.
SUBTOTAL	0.00	19.98	19.51	9.99	99.30	19.98	19.57	90.61	99.50	487.
TOTAL MID-RANGE SAMS	0.00	19.98	79.05	9.99	99.30	19.98	79.27	90.61	99.50	487.

TABLE 6 CYCLE 1 MED SAMS (UNDAMAGED) IN THEATER AT END OF CYCLE

LOCATION

	AREA COMMZ	AREA REAR-1	AREA FORWARD-1	BELT 1	AREA REAR-2	AREA FORWARD-2	BELT 2	THEATER TOTAL (OPERATIONAL)
LONG-RANGE SAMS								
SA-2	8.00	0.00	3.96	0.00	4.00	3.97	0.00	24.
SA-4	8.00	0.00	3.96	0.00	4.00	3.97	0.00	24.
SUBTOTAL	16.00	0.00	7.93	0.00	8.00	7.94	0.00	48.
MID-RANGE SAMS								
SA-6	0.00	0.00	97.84	-----	0.00	97.81	-----	196.
SUBTOTAL	0.00	0.00	97.84	-----	0.00	97.81	-----	196.
TOTAL	16.00	0.00	105.77	0.00	8.00	105.75	0.00	244.

	POINT COMMZ	POINT REAR-1	POINT FORWARD-1	POINT INTD-1	POINT COMBAT-1	POINT REAR-2	POINT FORWARD-2	POINT INTD-2	POINT COMBAT-2	THEATER TOTAL (OPERATIONAL)
MID-RANGE SAMS										
SA-6	200.00	19.92	18.12	9.94	176.84	19.95	17.73	88.71	180.42	739.
SUBTOTAL	200.00	19.92	18.12	9.94	176.84	19.95	17.73	88.71	180.42	739.
TOTAL MID-RANGE SAMS	200.00	19.92	115.96	9.94	176.84	19.95	115.54	88.71	180.42	934.

TABLE 7 CYCLE 1 SAMS IN REPAIR AND REPLACEMENT POOLS AND TOTAL MISSILES IN THEATER AT END OF CYCLE

	SAMS IN REPAIR POOL	SAMS IN REPLACEMENT POOL	TOTAL SAMS	TOTAL SAMS IN THEATER	MISSILES IN THEATER
BLUE					
LONG RANGE SAMS					
HERCULES	0.	10.	9.	19.	974.
HAWK	0.	10.	9.	19.	466.
TOTAL	0.	20.	18.	38.	1440.
MID RANGE SAMS					
CHAPARAL	1.	50.	507.	557.	4252.
TOTAL	1.	50.	507.	557.	4252.
RED					
LONG RANGE SAMS					
SA-2	0.	0.	24.	24.	1994.
SA-4	0.	0.	24.	24.	996.
TOTAL	0.	0.	48.	48.	2990.
MID RANGE SAMS					
SA-6	21.	0.	934.	956.	8692.
TOTAL	21.	0.	934.	956.	8692.

TABLE A CYCLE 1 AIR MUNITIONS EXPENDED ON CAS AND INTD, AND AIRCRAFT SHELTERS OPERATIONAL AND DESTROYED

AIR MUNITIONS TYPES

BLUE	MAVERICK	ROCKEYE	1000LBOMB	500LBOMB	CBU
EXPENDED IN CYCLE					
ON CAS	2657.	1328.	0.	1328.	1328.
ON INTD	0.	0.	288.	0.	0.
CUMULATIVE EXPENDED					
ON CAS AND INTD	2657.	1328.	288.	1328.	1328.

RED	1100LBOMB	550LBOMB	CBU
EXPENDED IN CYCLE			
ON CAS	0.	225.	225.
ON INTD	2160.	0.	0.
CUMULATIVE EXPENDED			
ON CAS AND INTD	2160.	225.	225.

AIRCRAFT SHELTERS AND RUNWAY STATUS

BLUE LOCATION	OPERATIONAL SHELTERS AT END OF CYCLE	SHELTERS DESTROYED DURING CYCLE	RUNWAY DAMAGE LEVEL/BASE
COMM2	0.00	0.00	0.00
REAR- 1	49.50	.50	.87
FORWARD- 1	405.34	14.66	25.63
REAR- 2	49.46	.54	1.05
FORWARD- 2	40.74	9.26	27.93
TOTAL	1045.04	24.96	

RED LOCATION	OPERATIONAL SHELTERS AT END OF CYCLE	SHELTERS DESTROYED DURING CYCLE	RUNWAY LEVEL/BASE
COMM2	300.00	.00	.00
REAR- 1	299.99	.01	.05
FORWARD- 1	299.98	.02	3.82
REAR- 2	299.87	.13	.44
FORWARD- 2	299.37	.63	24.68
TOTAL	1499.22	.78	

TABLE 9 CYCLE 1 BLUE CUMULATIVE SORTIES FLOWN (ATTEMPTED)

MISSION	AIRCRAFT TYPE F-104	A-7	F-4	F-111	TOTAL--ALL AIRCRAFT
CAS ATTK	0.00	150.00	540.00	0.00	690.
CAS ESCT	0.00	0.00	0.00	0.00	0.
CAS SSUP	0.00	0.00	270.00	0.00	270.
CAS DEF	450.00	0.00	0.00	0.00	450.
INTD ATTK	0.00	0.00	0.00	24.00	24.
INTD ESCT	0.00	0.00	135.00	0.00	135.
INTD SSUP	0.00	0.00	135.00	0.00	135.
ABAF ATTK	0.00	0.00	0.00	93.18	93.
ABAR ATTK	0.00	0.00	0.00	2.80	3.
ABAZ ATTK	0.00	0.00	0.00	.02	0.
SUBTOTAL	0.00	0.00	0.00	96.00	96.
ABAF ESCT	0.00	0.00	131.00	0.00	131.
ABAR ESCT	0.00	0.00	4.00	0.00	4.
ABAZ ESCT	0.00	0.00	0.00	0.00	0.
SUBTOTAL	0.00	0.00	135.00	0.00	135.
ABAF SSUP	0.00	0.00	131.00	0.00	131.
ABAR SSUP	0.00	0.00	4.00	0.00	4.
ABAZ SSUP	0.00	0.00	0.00	0.00	0.
SUBTOTAL	0.00	0.00	135.00	0.00	135.
BELT SSUP	0.00	0.00	0.00	0.00	0.
ABAF DEF	337.50	0.00	0.00	0.00	337.
ABAR DEF	112.50	0.00	0.00	0.00	112.
ABAZ DEF	0.00	0.00	0.00	0.00	0.
SUBTOTAL	450.00	0.00	0.00	0.00	450.
TOTAL	900.00	150.00	1350.00	120.00	2520.

HELICOPTERS-- 1200.00

TABLE 10 CYCLE 1 RED CUMULATIVE SORTIES FLOWN (ATTEMPTED)

MISSION	AIRCRAFT TYPE MIG-21	SU- 7	MIG-23	BADGER	TOTAL--ALL AIRCRAFT
CAS ATTK	125.00	72.00	0.00	0.00	197.
CAS ESCT	265.00	0.00	0.00	0.00	265.
CAS SSUP	125.00	48.00	0.00	0.00	173.
CAS DEF	500.00	0.00	250.00	0.00	750.
INTD ATTK	0.00	0.00	0.00	90.00	90.
INTD ESCT	120.00	0.00	0.00	0.00	120.
INTD SSUP	120.00	24.00	0.00	0.00	144.
ABAF ATTK	0.00	0.00	0.00	344.54	345.
ABAR ATTK	0.00	0.00	0.00	15.46	15.
ABAZ ATTK	0.00	0.00	0.00	0.00	0.
SUBTOTAL	0.00	0.00	0.00	360.00	360.
ABAF ESCT	233.14	0.00	0.00	0.00	233.
ABAR ESCT	6.86	0.00	0.00	0.00	7.
ABAZ ESCT	0.00	0.00	0.00	0.00	0.
SUBTOTAL	240.00	0.00	0.00	0.00	240.
ABAF SSUP	116.57	44.48	0.00	0.00	163.
ABAR SSUP	3.43	1.52	0.00	0.00	5.
ABAZ SSUP	0.00	0.00	0.00	0.00	0.
SUBTOTAL	120.00	48.00	0.00	0.00	168.
BELT SSUP	385.00	48.00	0.00	0.00	433.
ABAF DEF	336.00	0.00	150.00	0.00	486.
ABAR DEF	146.00	0.00	60.00	0.00	206.
ABAZ DEF	18.00	0.00	40.00	0.00	58.
SUBTOTAL	500.00	0.00	250.00	0.00	750.
TOTAL	2500.00	240.00	500.00	450.00	3690.

HELICOPTERS-- 0.00

TABLE 11 CYCLE 1 BLUE CUMULATIVE AIRCRAFT KILLED IN AIR (BY MISSION) AND HELICOPTERS KILLED IN AIR

	AIRCRAFT TYPE				
MISSION	F-104	A-7	F-4	F-111	TOTAL--ALL AIRCRAFT
CAS ATTK	0.00	2.80	3.24	0.00	6.
CAS ESCT	0.00	0.00	0.00	0.00	0.
CAS SSUP	0.00	0.00	26.87	0.00	27.
CAS DEF	9.10	0.00	0.00	0.00	9.
INTD ATTK	0.00	0.00	0.00	.52	1.
INTD ESCT	0.00	0.00	2.10	0.00	2.
INTD SSUP	0.00	0.00	3.01	0.00	3.
ABAF ATTK	0.00	0.00	0.00	2.44	2.
ABAR ATTK	0.00	0.00	0.00	.18	0.
ABAZ ATTK	0.00	0.00	0.00	.00	0.
SUBTOTAL	0.00	0.00	0.00	2.62	3.
ABAF ESCT	0.00	0.00	2.05	0.00	2.
ABAR ESCT	0.00	0.00	.09	0.00	0.
ABAZ ESCT	0.00	0.00	0.00	0.00	0.
SUBTOTAL	0.00	0.00	2.14	0.00	2.
ABAF SSUP	0.00	0.00	2.87	0.00	3.
ABAR SSUP	0.00	0.00	.16	0.00	0.
ABAZ SSUP	0.00	0.00	0.00	0.00	0.
SUBTOTAL	0.00	0.00	3.03	0.00	3.
BELT SSUP	0.00	0.00	0.00	0.00	0.
ABAF DEF	1.48	0.00	0.00	0.00	1.
ABAR DEF	.02	0.00	0.00	0.00	0.
ABAZ DEF	0.00	0.00	0.00	0.00	0.
SUBTOTAL	1.50	0.00	0.00	0.00	1.
TOTAL	10.60	2.80	40.38	3.15	57.
HELICOPTERS--		32.01			

TABLE 12 CYCLE 1 RED CUMULATIVE AIRCRAFT KILLED IN AIR (BY MISSION) AND HELICOPTERS KILLED IN AIR

	AIRCRAFT TYPE				
MISSION	MIG-21	SU- 7	MIG-23	BADGER	TOTAL--ALL AIRCRAFT
CAS ATTK	.81	.51	0.00	0.00	1.
CAS ESCT	1.20	0.00	0.00	0.00	1.
CAS SSUP	16.44	6.27	0.00	0.00	23.
CAS DEF	17.70	0.00	7.20	0.00	25.
INTD ATTK	0.00	0.00	0.00	5.11	5.
INTD ESCT	1.38	0.00	0.00	0.00	1.
INTD SSUP	3.52	.64	0.00	0.00	4.
ABAF ATTK	0.00	0.00	0.00	23.42	23.
ABAR ATTK	0.00	0.00	0.00	.90	1.
ABAZ ATTK	0.00	0.00	0.00	0.00	0.
SUBTOTAL	0.00	0.00	0.00	24.33	24.
ABAF ESCT	2.69	0.00	0.00	0.00	3.
ABAR ESCT	.11	0.00	0.00	0.00	0.
ABAZ ESCT	0.00	0.00	0.00	0.00	0.
SUBTOTAL	2.80	0.00	0.00	0.00	3.
ABAF SSUP	4.68	1.90	0.00	0.00	7.
ABAR SSUP	.08	.04	0.00	0.00	0.
ABAZ SSUP	0.00	0.00	0.00	0.00	0.
SUBTOTAL	4.76	1.94	0.00	0.00	7.
BELT SSUP	4.32	.55	0.00	0.00	5.
ABAF DEF	6.51	0.00	1.90	0.00	8.
ABAR DEF	.07	0.00	.03	0.00	0.
ABAZ DEF	.00	0.00	.00	0.00	0.
SUBTOTAL	6.58	0.00	1.92	0.00	9.
TOTAL	59.51	9.91	9.12	29.44	108.
HELICOPTERS--		0.00			

TABLE 13 CYCLE 1 BLUE CUMULATIVE AIRCRAFT KILLED ON GROUND

	FORWARD AIRBASES		REAR AIRBASES		COMMZ AIRBASES		TOTAL	TOTAL DAMAGED AND UNDAMAGED
	SHELTERED	NON SHELTERED	SHELTERED	NON SHELTERED	SHELTERED	NON SHELTERED		
UNDAMAGED AIRCRAFT								
AIRCRAFT								
F-104	10.27	36.51	.68	.33	0.00	0.00	54.	------
A-7	3.27	0.00	.14	0.00	0.00	0.00	3.	------
F-4	20.16	0.00	1.00	0.00	0.00	0.00	21.	------
F-111	4.53	0.00	.15	0.00	0.00	0.00	3.	------
TOTAL	44.	37.	2.	0.	0.	0.	81.	------
DAMAGED AIRCRAFT								
AIRCRAFT								
F-104	.03	.08	.00	.01	0.00	0.00	0.	54.
A-7	.00	.03	.00	.00	0.00	0.00	0.	3.
F-4	.06	1.37	.00	.07	0.00	0.00	1.	23.
F-111	0.00	0.00	0.00	0.00	0.00	0.00	0.	3.
TOTAL	0.	1.	0.	0.	0.	0.	2.	83.
ORA AIRCRAFT								
AIRCRAFT								
F-4	-.00	-.00	-.00	-.00	0.00	0.00	-0.	------
F-111	.73	0.00	0.00	0.00	0.00	0.00	5.	------
TOTAL	5.	-0.	-0.	-0.	0.	0.	5.	------

TABLE 14 CYCLE 1 RED CUMULATIVE AIRCRAFT KILLED ON GROUND

	FORWARD AIRBASES		REAR AIRBASES		COMM7 AIRBASES		TOTAL	TOTAL DAMAGED AND UNDAMAGED
	SHELTERED	NON SHELTERED	SHELTERED	NON SHELTERED	SHELTERED	NON SHELTERED		
UNDAMAGED AIRCRAFT								
AIRCRAFT								
MIG-21	.71	52.18	.20	.35	.00	0.00	53.	------
SU- 7	.29	0.00	.00	0.00	.00	0.00	0.	------
MIG-23	.29	0.00	.06	0.00	.00	0.00	0.	------
BADGER	0.00	8.93	0.00	.43	0.00	.00	9.	------
TOTAL	1.	61.	0.	1.	0.	0.	63.	------
DAMAGED AIRCRAFT								
AIRCRAFT								
MIG-21	0.00	.42	0.00	.02	-.00	.00	0.	54.
SU- 7	0.00	.06	0.00	.00	.00	0.00	0.	0.
MIG-23	.00	.04	.00	.00	.00	0.00	0.	0.
BADGER	0.00	.29	0.00	0.00	0.00	0.00	0.	10.
TOTAL	0.	1.	0.	0.	0.	0.	1.	64.
GRA AIRCRAFT								
AIRCRAFT								
BADGER	0.00	13.82	0.00	0.00	0.00	0.00	14.	------
TOTAL	0.	14.	0.	0.	0.	0.	14.	------

TABLE 15 CYCLE 1 CUMULATIVE AIRCRAFT AND HELICOPTERS DAMAGED AND REPAIRED, AND AIRCRAFT CONVERTED TO QRA

BLUE

	CUMULATIVE AIRCRAFT DAMAGED IN AIR	CUMULATIVE REPAIRED AIRCRAFT
AIRCRAFT		
F-104	2.56	0.00
A-7	.12	0.00
F-4	14.18	0.00
F-111	.93	0.00
TOTAL	18.	0.
HELICOPTERS	0.	0.

	CUMULATIVE AIRCRAFT CONVERTED TO QRA FORWARD	REAR	COMMZ	TOTAL
AIRCRAFT				
F-4	4.73	0.00	0.00	5.
F-111	0.00	0.00	0.00	0.
TOTAL	5.	0.	0.	5.

RED

	CUMULATIVE AIRCRAFT DAMAGED IN AIR	CUMULATIVE REPAIRED AIRCRAFT
AIRCRAFT		
MIG-21	17.76	0.00
SU- 7	3.06	0.00
MIG-23	2.14	0.00
BADGER	10.96	0.00
TOTAL	34.	0.
HELICOPTERS	0.	0.

	CUMULATIVE AIRCRAFT CONVERTED TO QRA FORWARD	REAR	COMMZ	TOTAL
AIRCRAFT				
BADGER	13.82	0.00	0.00	14.
TOTAL	14.	0.	0.	14.

TABLE 16 CYCLE 1 CUMULATIVE SUCCESSFUL ATTACK SORTIES

	CAS	INTERDICTION	ABA FORWARD	ABA REAR	ABA COMMZ	ABA TOTAL	GRAND TOTAL
BLUE							
AIRCRAFT							
F-104	0.	0.	0.	0.	0.	0.	0.
A-7	142.	0.	0.	0.	0.	0.	142.
F-4	513.	0.	0.	0.	0.	0.	513.
F-111	0.	22.	83.	2.	0.	85.	107.
TOTAL	655.	22.	83.	2.	0.	85.	762.
HELICOPTERS	990.						
RED							
AIRCRAFT							
MIG-21	121.	0.	0.	0.	0.	0.	121.
SU- 7	69.	0.	0.	0.	0.	0.	69.
MIG-23	0.	0.	0.	0.	0.	0.	0.
BADGER	0.	81.	303.	14.	0.	318.	399.
TOTAL	190.	81.	303.	14.	0.	318.	589.
HELICOPTERS	0.						

TABLE 17 CYCLE 1 BLUE CUMULATIVE SAMS KILLED IN THEATER AT END OF CYCLE

LOCATION

	AREA COMMZ	AREA-ALL REAR	AREA-ALL FORWARD	BELT ALL		THEATER TOTAL
LONG-RANGE SAMS						
HERCULES	0.00	.00	.01	.07		0.
HAWK	0.00	.00	.01	.11		0.
SUBTOTAL	0.00	.00	.02	.18		0.
MID-RANGE SAMS						
CHAPARAL	0.00	0.00	.60	-----		1.
SUBTOTAL	0.00	0.00	.60	-----		1.
TOTAL	0.00	.00	.62	.18		1.

	POINT COMMZ	POINT-ALL REAR	POINT-ALL FORWARD	POINT-ALL INTD	POINT-ALL COMBAT	THEATER TOTAL
MID-RANGE SAMS						
CHAPARAL	0.00	.02	.74	.30	.94	2.
SUBTOTAL	0.00	.02	.74	.30	.94	2.
TOTAL MID-RANGE SAMS	0.00	.02	1.34	.30	.94	3.

TABLE 18 CYCLE 1 RED CUMULATIVE SAMS KILLED IN THEATER AT END OF CYCLE

LOCATION

	AREA COMMZ	AREA-ALL REAR	AREA-ALL FORWARD	BELT ALL	THEATER TOTAL
LONG-RANGE SAMS					
SA-2	0.00	.00	.05	0.00	0
SA-4	0.00	.00	.05	0.00	0
SUBTOTAL	0.00	.00	.10	0.00	0
MID-RANGE SAMS					
SA-6	0.00	0.00	3.48	-----	3
SUBTOTAL	0.00	0.00	3.48	-----	3
TOTAL	0.00	.00	3.59	0.00	4

	POINT COMMZ	POINT-ALL REAR	POINT-ALL FORWARD	POINT-ALL INTD	POINT-ALL COMBAT	THEATER TOTAL
MID-RANGE SAMS						
SA-6	0.00	.10	3.31	3.48	24.00	31
SUBTOTAL	0.00	.10	3.31	3.48	24.00	31
TOTAL MID-RANGE SAMS	0.00	.10	6.79	3.48	24.00	34

TABLE 19 CYCLE 1 SAMS SUPPRESSED DURING CYCLE AND CUMULATIVE SAMS DAMAGED AND REPAIRED

	SAMS SUPPRESSED DURING CYCLE	CUMULATIVE SAMS DAMAGED	CUMULATIVE SAMS REPAIRED
BLUE			
LONG RANGE SAMS			
HERCULES	.08	0.	0.
HAWK	.22	0.	0.
TOTAL	.30	0.	0.
MID RANGE SAMS			
CHAPARAL	30.71	1.	0.
TOTAL	30.71	1.	0.
RED			
LONG RANGE SAMS			
SA-2	.01	0.	0.
SA-4	.03	0.	0.
TOTAL	.04	0.	0.
MID RANGE SAMS			
SA-6	58.16	21.	0.
TOTAL	58.16	21.	0.

TABLE 20 CYCLE 1 CUMULATIVE AIRCRAFT KILLED OR DAMAGED IN AIR (BY CLASS OF SHOOTER)

RED TARGET AIRCRAFT BY TYPE

BLUE SHOOTER	MIG-21	SU- 7	MIG-23	BADGER	TOTAL
ATT ACFT	2.34	0.00	1.41	0.00	4.
ESC ACFT	27.00	0.00	9.75	0.00	37.
DEF ACFT	9.64	1.44	0.00	7.41	18.
LR SAM	2.88	.37	0.00	2.10	5.
MR SAM	31.59	10.60	0.00	24.26	66.
WAY HOME	3.70	1.15	.10	6.23	11.
TOTAL	77.27	13.57	11.26	39.99	142.

BLUE TARGET AIRCRAFT BY TYPE

RED SHOOTER	F-104	A-7	F-4	F-111	TOTAL
ATT ACFT	1.03	0.00	0.00	0.00	1.
ESC ACFT	12.01	0.00	0.00	0.00	12.
DEF ACFT	0.00	2.67	13.70	2.26	19.
LR SAM	0.00	0.00	.22	.11	0.
MR SAM	0.00	.27	36.23	1.04	38.
WAY HOME	.13	.58	4.41	.66	6.
TOTAL	13.16	3.52	54.56	4.08	75.

TABLE 21 CYCLE 1 SELECTED MEASURES OF EFFECTIVENESS

MEASURE OF EFFECTIVENESS (1)	BLUE	RED	BLUE MINUS RED	BLUE DIVIDED BY RED
CAS ORDNANCE DELIVERED	49297.	326.	48971.	151.35
INTD ORDNANCE DELIVERED	260.	2409.	-2149.	.11
CAS PLUS INTD ORD DELIVERED	49556.	2735.	46821.	18.12
WEIGHTED AIRCRAFT SURVIVING	3503.	3681.	-178.	.95
WEIGHTED SAMS SURVIVING	16.	33.	-17.	.48
ORD DELIVERED PLUS ACFT, SAMS SURVIVING	53079.	6449.	46629.	8.23
WEIGHTED AIRCRAFT-CYCLES	3700.	3900.	-200.	.95

			RED MINUS BLUE	RED DIVIDED BY BLUE
WEIGHTED AIRCRAFT LOST	197.	219.	22.	1.12
AIRCRAFT LOSS RATE PER CYCLE	.05	.06	.00	1.06

(1) AIRCRAFT DATA INCLUDE HELICOPTERS

APPENDIX H

DEFINITIONS OF VARIABLES USED IN IDATAM

CONTENTS OF APPENDIX H

Section 1

ALPHABETICAL LIST OF INPUT VARIABLES

Variable	Definition
AACT(IAC,J,L)	Alphanumeric identifier for type IAC aircraft on side L (J = 1,2).
AAMT(IAM,J,L)	Alphanumeric identifier for type IAM air munitions on side 1 (J = 1,2).
ABASEF(IS,L)	Number of actual airbases that compose the notional forward airbase in sector IS for side L.
ABASER(IS,L)	Number of actual airbases that compose the notional rear airbase in sector IS for side L.
ABASEZ(L)	Number of actual airbases that compose the notional COMMZ airbase on side L.
ABATPS(IAC,L)	Number of ground targets per sortie that a side L type IAC aircraft can engage on ABA missions.
ABMXFA(IS,L)	Maximum number of non-QRA aircraft of any type on an actual forward airbase in sector IS on side L (no more aircraft will be automatically added after this maximum is reached).
ABMXRA(IS,L)	Maximum number of non-QRA aircraft of any type on an actual rear airbase in sector IS on side L (no more aircraft will be automatically added after this maximum is reached).
ACCZ(IAC,L)	Number of side L type IAC aircraft (not damaged, not QRA) on COMMZ airbases.
ACCZDM(IAC,L)	Number of side L type IAC aircraft which are damaged and are on COMMZ airbases.
ACFS(IAC,IS,L)	Number of side L type IAC aircraft (not damaged, not QRA) on forward airbases in sector IS.

Variable	Definition
ACFSDM(IAC,IS,L)	Number of side L type IAC aircraft which are damaged and are on forward airbases in sector IS.
ACRS(IAC,IS,L)	Number of side L type IAC aircraft (not damaged, not QRA) on rear airbases in sector IS.
ACRSDM(IAC,IS,L)	Number of side L type IAC aircraft which are damaged and are on rear airbases in sector IS.
AEDCA(IAC,L)	Average number of additional engagements (in addition to 1.0) that a side L type IAC CAS defender can potentially make against enemy attackers per sortie.
AEDCE(IAC,L)	Average number of additional engagements (in addition to 1.0) that a side L type IAC CAS defender can potentially make against enemy escorts per sortie.
AEDGA(IAC,L)	Average number of additional engagements (in addition to 1.0) that a side L type IAC escort can potentially make against enemy attackers per sortie.
AEDGE(IAC,L)	Average number of additional engagements (in addition to 1.0) that a side L type IAC defender can potentially make.
AEEGE(IAC,L)	Average number of additional engagements (in addition to 1.0) that a side L type IAC escort can potentially make.
AESGS(IAC,L)	Average number of additional engagements (in addition to 1.0) that a side L type IAC SAM suppressor can potentially make against enemy SAMs.
ALRS(ILS,J,L)	Alphanumeric identifier for type ILS long range SAMs on side L (J = 1,2).
ALRSF(ILS,IS,L)	Number of side L type ILS long range SAMs providing area defenses in front of forward airbases in sector IS.
ALRSR(ILS,IS,L)	Number of side L type ILS long range SAMs providing area defenses in front of rear airbases in sector IS.
ALRSZ(ILS,L)	Number of side L type ILS long range SAMs providing area defenses in front of COMMZ airbases.

Variable	Definition
AMLFR(IAC,L)	Air munition load factor to account for the additional distance that a rear based side L type IAC aircraft flies when on CAS missions.
AMLFRI(IAC,L)	Air munition load factor to account for the additional distance that a rear based side L type IAC aircraft flies when on INTD missions.
AMLFZ(IAC,L)	Air munition load factor to account for the additional distance that a COMMZ based side L type IAC aircraft flies when on CAS missions.
AMLFZI(IAC,L)	Air munition load factor to account for the additional distance that a COMMZ based side L type IAC aircraft flies when on INTD missions.
AMNL(IAC,IAM,L)	Number of air munitions of type IAM in a notional load of a side L type IAC aircraft based on a forward airbase flying CAS missions.
AMNLI(IAC,IAM,L)	Number of air munitions of type IAM in a notional load of a side L type IAC aircraft based on a forward airbase flying INTD missions.
AMRS(IMS,J,L)	Number of side L type IMS medium range SAMs providing area defenses in front of forward airbases in sector IS.
AMRSR(IMS,IS,L)	Number of side L type IMS medium range SAMs providing area defenses in front of rear airbases in sector IS.
AMRSZ(IMS,L)	Number of side L type IMS medium range SAMs providing area defenses in front of COMMZ airbases.
AMTLRS(ILS,L)	Actual number of missiles in theater for type ILS long range SAMs on side L.
AMTMRS(IMS,L)	Actual number of missiles in theater for type IMS medium range SAMs on side L.
AMXRAB(L)	Maximum number of side L aircraft of any type that can be repaired in one cycle on an operational airbase.
AMXRPL(L)	Maximum number of side L aircraft of any type that can be repaired in one cycle in the repair pool.

Variable	Definition
ASLSBC(ILS,L)	Average number of possible shots per fire control center of type ILS long range SAMs on side L in the belt at enemy CAS attackers.
ASLSBS(ILS,L)	Average number of possible shots per fire control center of type ILS long range SAMs on side L at enemy belt SAM suppressors.
ASLSFB(ILS,L)	Average number of possible shots per fire control center of type ILS long range SAMs on side L at enemy aircraft on a fly-by role.
ASMSFB(IMS,L)	Average number of possible shots per fire control center of type IMS medium range SAMs on side L at enemy aircraft on a fly-by role.
ASPMSA(IMS,L)	Average number of possible shots per fire control center of type IMS medium point SAMs on side L at enemy attackers.
ASPMSC(IMS,L)	Average number of possible shots per fire control center of type IMS SAMs in combat or side L at enemy CAS attackers.
ASPMSH(IMS,L)	Average shots that a point medium SAM of type IMS can make at helicopters.
BLRS(ILS,IS,L)	Number of side L type ILS long range SAMs in the belt in sector IS.
CRAC(IAC,L)	Cross (lateral) range (from far left to far right) of a type IAC aircraft on side L.
CRLRS(ILS,L)	Cross (lateral) range (from far left to far right) of a type ILS long range SAM on side L.
CRMRS(IMS,L)	Cross (lateral) range (from far left to far right) of a type IMS medium range SAM on side L.
DAMPL(IAC,L)	Number of side L type IAC aircraft that are damaged and are in the maintenance pool.
DHMPL(L)	Number of damaged helicopters in the repair maintenance pool for side L.
DLSMPL(ILS,L)	Number of side L type ILS long range SAMs that are damaged and are in the maintenance pool.

Variable	Definition
DMSMPL(IMS,L)	Number of side L type IMS medium range SAMs that are damaged and are in the maintenance pool.
DQRAF(IS,L)	Desired number of QRA aircraft (of any type) on forward airbases in sector IS for side L.
DQRAR(IS,L)	Desired number of QRA aircraft (of any type) on rear airbases in sector IS for side L.
DQRAZ(L)	Desired number of QRA aircraft (of any type) on COMMZ airbases on side L.
EFAGT(IAC,L)	Estimated fraction of initial (cycle) inventory of undamaged aircraft on side L that will be on the ground as targets for enemy ABA missions.
EFFSHL(L)	Estimated fraction of shelters on side L that will be full on side L when the ABA attack occurs, if there are more aircraft than shelters.
FAABAA(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly ABA attack missions.
FAABAD(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly ABA defense missions.
FAABAE(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly ABA escort missions.
FAABAS(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly ABA SAM-suppression missions.
FAALRS(ILS,L)	Availability factor for area ILS long range SAMs on side L.
FAAMRS(IMS,L)	Availability factor for area IMS medium SAM on side L.
FABASM(IAC,L)	Fraction of aircraft of type IAC on ABA missions for side L that use standoff munitions to avoid being shot at by medium range SAMs.
FABASS(IS,KS,L)	Fraction of side L aircraft on CASA, CASE, CASS, and CASD missions based in sector IS that fly to sector KS.
FABDRF(IAC,L)	Fraction of side L type IAC aircraft on ABAD missions and based on rear airbases that fly to defend in front of forward airbases.

Variable	Definition
FABDZF(IAC,L)	Fraction of side L type IAC aircraft on ABAD missions and based in the COMMZ that fly to defend in front of forward airbases.
FABDZR(IAC,L)	Fraction of side L type IAC aircraft on ABAD missions and based in the COMMZ that fly to defend in front of rear airbases.
FABSUP(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly belt SAM-suppression missions.
FACASA(IAC,L)	Fraction of aircraft of type lAC on side L assigned to fly CAS attack missions.
FACASD(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly CAS defense missions.
FACASE(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly CAS escort missions.
FACASS(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly CAS SAM-suppression missions.
FADFMP(IAC,L)	Fraction of side L type IAC aircraft based on forward airbases that, when damaged in the air, are sent to the maintenance pool.
FADRMP(IAC,L)	Fraction of side L type IAC aircraft based on rear airbases that, when damaged in the air, are sent to the maintenance pool.
FADZMP(IAC,L)	Fraction of side L type IAC aircraft based on COMMZ airbases that, when damaged in the air, are sent to the maintenance pool.
FAGSCN(IAC,L)	Fraction of side L type IAC aircraft that are on the ground and assigned shelters that are caught unsheltered.
FAINDA(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly interdiction attack missions.
FAINDE(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly interdiction escort missions.
FAINDS(IAC,L)	Fraction of aircraft of type IAC on side L assigned to fly interdiction SAM-suppression missions.

Variable	Definition
FAKWH(L)	Factor for computing the number of attackers on side L killed on their way home.
FAMZS(KS,L)	Fraction of aircraft that fly from the COMMZ on side L into sector KS. (This variable is also used to allocate defensive missions and SAMs in the COMMZ to attackers by sector.) Values should sum to 1 over KS.
FAPMRS(IMS,L)	Availability factor for point IMS medium SAM on side L.
FAUSHL(L)	Fraction of side L aircraft that can use another aircraft shelter while that other aircraft is out flying its mission.
FCAIA(IAC,L)	Fraction of a cycle that a side L type IAC aircraft is in the air.
FCASSM(IAC,L)	Fraction of aircraft of type IAC on CAS missions for side L that use standoff munitions to avoid being shot at by medium range SAMs.
FCASSS(IS,KS,L)	Fraction of side L aircraft on ABAA, ABAE, ABAS, and BSUP missions based in sector IS that fly to sector KS.
FDBMSC(L)	Fraction applied to PDSMSC(IAC,L) to give the probability that a side L type IAC belt SAM suppressor detects an enemy point medium range SAM in combat.
FDKWH(L)	Factor for computing the number of defenders on side L killed on their way home.
FDMEAC(IAC,L)	Fraction of side L type IAC defenders that move to engage ABA attackers (applied to CAS defenders) within the sector.
FDMEAF(IAC,L)	Fraction of side L type IAC defenders that move to engage ABA attackers (applied to ABD forward defenders) within the sector.
FDMEAR(IAC,L)	Fraction of side L type IAC defenders that move to engage ABA attackers (applied to ABD rear defenders) within the sector.

AD-A071 501 INSTITUTE FOR DEFENSE ANALYSES ARLINGTON VA PROGRAM --ETC F/G 15/7
DOCUMENTATION OF THE IDA TACTICAL AIR MODEL (IDATAM) COMPUTER P--ETC(U)
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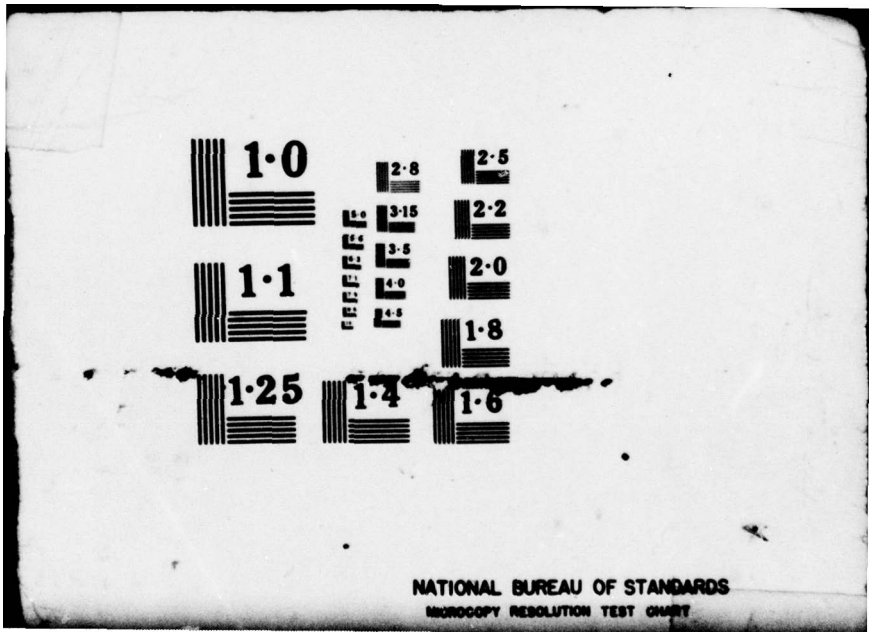
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MICROCOPY RESOLUTION TEST CHART

Variable	Definition
FDMEAZ(IAC,L)	Fraction of side L type IAC defenders that move to engage ABA attackers (applied to ABD COMMZ defenders) within the sector.
FDMSCB(L)	Factor applied to PDMSCS(IMS,L) to give the probability that a side L type IMS point medium range SAM in combat detects an enemy belt SAM suppressor.
FEKWH(L)	Factor for computing the number of escorts on side L killed on their way home.
FINDSM(IAC,L)	Fraction of aircraft of type IAC on INTD missions for side L that use standoff munitions to avoid being shot at by MRS enemy surface-to-air weapons.
FINDSS(IS,KS,L)	Fraction of side L aircraft on INTDA, INTDE, and INTDS missions based in sector IS that fly to sector KS.
FKLAA(IAC,L)	Fraction of kills which are lethal when an enemy aircraft shoots at a type IAC aircraft on side L.
FKLALS(ILS,L)	Fraction of kills which are lethal when an enemy aircraft shoots at an ILS long range surface-to-air weapon on side L.
FKLAMS(IMS,L)	Fraction of kills which are lethal when an enemy aircraft shoots at an IMS medium range surface-to-air weapon on side L.
FKLHEL(L)	Fraction of kills that are lethal to helicopters on side L.
FKLHMS(IMS,L)	Fraction of kills that are lethal when a enemy helicopter shoots at a medium range SAM of type IMS on side L.
FKLLSA_ILS,L)	Fraction of kills which are lethal when a long range surface-to-air weapon of type ILS on side L shoots at enemy aircraft.
FKLMSA(IMS,L)	Fraction of kills which are lethal when a medium range surface-to-air weapon of type IMS on side L shoots at enemy aircraft.
FLRSCA(ILS,L)	Fraction of side L type ILS long range SAMs located outside of the attack corridor but within cross range of the attacker escorts that shoot at the attacker's attack aircraft.

Variable	Definition
FLSVSS(ILS,L)	Fraction of long range SAMs on side L that are vulnerable to SAM attackers.
FMSCKG(IMS,L)	Fraction of side L type IMS point medium range SAMs in combat that are killed by enemy ground fire per cycle (not currently available for use).
FMSCSF(IMS,L)	Fraction of available unsuppressed type-IMS, side L point medium range SAMs in combat that can shoot at enemy aircraft flying by.
FMSVSS(IMS,L)	Fraction of medium range SAMs on side L that are vulnerable to SAM attackers.
FPKBSS(IAC,L)	Fraction for adjusting probability of kill (applied to PKSSLS) to give PK of belt SAM suppressors of type IAC on side L against enemy belt SAMs.
FPKSD(IAC,L)	Factor for degrading probability of kill (applied to PKED) to give PK of SAM suppressors of type IAC on side L against enemy defenders.
FPSBSS(IAC,L)	Factor for adjusting probability of suppression (applied to PSSSLS) to give PS of belt SAM suppressors of type IAC on side L against enemy belt SAMs.
FQRACZ(J,L)	Fraction of total desired QRA aircraft that is desired to be of type J on COMMZ airbases on side L.
FQRAFS(J,L)	Fraction of total desired QRA aircraft that is desired to be of type J on forward airbases for side L.
FQRARS(J,L)	Fraction of total desired QRA aircraft that is desired to be of type J on rear airbases for side L.
FSACAS(IS,L)	Fraction of sector IS in which CASA and CASS aircraft on side L concentrate their attack.
FSBLSC(I,IS,L)	For I=1 this variable states whether belt SAMs and CASD aircraft can operate in the same parts (=0.) or not (=1.) of sector IS on side L. For I=2 it gives the fraction of enemy CASA and CASS aircraft that are vulnerable to belt SAMs in sector IS on side L.

Variable	Definition
FSCASD(IS,L)	Fraction of sector IS in which CASD aircraft on side L can operate to engage enemy targets.
FSKSAK(IAC,L)	Fraction of shelters that are killed when a side L type IAC aircraft is able to attack a shelter in such a way that the aircraft inside it would be killed.
FSKWH(L)	Factor of computing the number of SAM suppressors on side L killed on their way home.
FSMRSC(IMS,L)	Fraction of a sector in which side L type IMS point medium range SAMs are allowed to fire at any enemy targets.
FSRAES(L)	Factor for converting ABAE sortie rate to ABAS sortie rate for side L.
FSRCES(L)	Factor for converting CASE sortie rate to CASS sortie rate for side L.
FSRIES(L)	Factor for converting INTDE sortie rate to INTDS sortie rate for side L.
FSSSLS(IAC,L)	Fraction of SAM suppressors on side L that use standoff munitions to avoid being shot at by enemy long range surface-to-air weapons.
FSSSMS(IAC,L)	Fraction of SAM suppressors of type IAC on side L that use standoff munitions to avoid being shot at by enemy medium range surface-to-air weapons.
HELI(IS,L)	Number of side L helicopters in sector IS.
HMXRPL(L)	Maximum number of side L helicopters of any type that can be repaired in one cycle in the repair pool.

Variable	Definition
IABAAG(L)	Index for computing ABA air-to-ground attrition (attackers on side L). = 1, if point attack of sheltered and open aircraft, attack shelters only if no open aircraft are detected, no shelters on parking areas. = 2, if point attack of sheltered and open aircraft, attack shelters or open aircraft optimally. = 3, if point attack of sheltered and open aircraft, attack a parking area if either a shelter or open aircraft is detected on that area. = 4, if area fire for both shelters and open aircraft (not currently available). = 5, if area fire for open aircraft, point fire for shelters (not currently available). = 6, if area fire for shelters, point fire for open aircraft (not currently available).
IATRTF(II,L)	Index of attrition functions to be used when side L is the attacker and the interaction is given by II, where II takes values given by: II = 1, defender vs. escorts. 2, defender vs. attacker/SAM suppressor. 3, long range SAMs vs. SAM suppressor. 4, long range SAMs vs. attacker/escort. 5, area medium range SAM vs. SAM suppressor. 6, area medium range SAM vs. fly-by. 7, point medium range SAM vs. SAM suppressor. 8, point medium range SAM vs. attackers.
IINTPS(IS,L)	Index of Interoperability of airbases in sector IS on side L. The following values are allowed:

INTEROPERABILITY BETWEEN THE ACTUAL BASES THAT COMPRISE A NOTIONAL BASE	INTEROPERABILITY BETWEEN FORWARD AND REAR BASES		
	Always (Also Replacements)	Starting on Second Day (Also Replacements)	Never (Replacements Starting on Second Day)
Always	3	N/A	- 3
Starting on Second Day	2	1	- 2
Never	11	0	-1

(Whenever either sector allows interoperability among notional bases, then interoperability is allowed in the COMMZ.)

Variable	Definition
IPRDO(II)	Index for printing detailed output.
IPRSO(II)	Index for printing summary output. Summary output is printed automatically on cycles 1, NCYCLE, and whenever a detailed printout is made.
IPSHLA(JAC,L)	Index of priority sheltering for aircraft on side L, e.g., IPSHLA(1,1)=IAC if type IAC Blue aircraft are to be sheltered first.
IPSQRA(JJ,L)	Index for priority for selecting aircraft to fill QRA shortfalls on side L, e.g., IPSQRA(1,1)=J if Blue type J QRA aircraft are to be the first selected to fill QRA shortfalls.
IQRAP(J,L)	Index for indicating for side L which regular type of aircraft corresponds to the Jth type of QRA aircraft.
IRAC(IAC,II,L)	Index of range for side L type IAC aircraft stationed in airbases whose location is given by II (II = 1 means forward airbases, II = 2 means rear airbases, II = 3 means COMMZ airbases). = 1, if aircraft of type IAC based in II can fly only air defense. = 2, if aircraft of type IAC based in II can fly at most CAS. = 3, if aircraft of type IAC based in II can fly at most to enemy forward airbases. = 4, if aircraft of type IAC based in II can fly at most to enemy rear airbases. = 5, if aircraft of type IAC based in II can fly everywhere.
IRNCPD	Cycles per day for runway repair. This variable is used to determine if the time between cycle N and N+1 is overnight or not, and to determine the end of the first day for interoperability considerations.
ITAMRS(L)	Index of allowable targets for area medium range SAMs on side L. = 0, if all aircraft are targets. = 1, if PMRSC (in area fire role) cannot shoot. = 2, if area SAMs cannot shoot at escorts but PMRSC can. = 3, if neither can shoot at escorts.

Variable	Definition
NAC(L)	Number of types of aircraft on side L.
NAM(L)	Number of types of air munitions on side L.
NCYCLE	Number of cycles being played.
NEPD	Dummy variable used to indicate the start of COMMON for the input routine, its value is irrelevant.
NLS(L)	Number of types of long range SAMs on side L.
NMS(L)	Number of types of medium range SAMs on side L.
NQRAT(L)	Number of different aircraft types designated as QRA aircraft on side L.
NS	Number of sectors being played.
NVAMCF(L) VAMCFX(I,L) VAMCFY(II,I,L)	These parameters define the functional relationship VAMCF(II,ICYCLE), which is used to compute a factor for the value of air munitions delivered during the cycle as a function of II (II = 1 denotes CAS, II = 2 denotes INTD) and the index of the cycle, ICYCLE. NVAMCF(L) — the number of endpoints used in the piecewise linear segments of the function (I = 1,...,NVAMCF(L)). VAMCFX(I,L) — the cycle which, together with the type of mission (II), gives the abscissa coordinate of the Ith endpoint of the function VAMCF. VAMCFY(II,I,L) — the value of the function VAMCF at the point (II,

Variable	Definition
NVAMQF(L) VAMQFX(I,L) VAMQFY(II,I,L)	These parameters define the functional relationship VAMQF(II,VAMB), which is used to compute a factor for the value of air munitions delivered as a function of II (II = 1 denotes CAS, II = 2 denotes INTD) and the quantity of air munitions delivered during the cycle, VAMB. NVAMQF(L) — the number of endpoints used in the piecewise linear segments of the function (I = 1,...,NVAMQF(L)). VAMQFX(I,L) — the quantity of air munitions delivered which, together with the type of mission (II), gives the abscissa coordinate of the Ith endpoint of the function VAMQF. VAMQFY(II,I,L) — the value of the function VAMQF at the point (II,VAMQFX(I,L)), for side L.
PAJOR(IAC,L)	Probability that an attacker of type IAC on side L when engaged by an enemy defender, jettisons its ordnance and returns fire (otherwise it tries to outrun the defender).
PARHLS(ILS,IAC,L)	Probability that an aircraft of type IAC returns home when engaged by an enemy long range SAM of type ILS on side L.
PARHMS(IMS,IAC,L)	Probability that an aircraft of type IAC returns home when engaged by an enemy medium range SAM of type IMS on side L.
PARKAB(L)	Number of parking areas for aircraft on a typical actual airbase on side L.
PDAECD(IAC,L)	Probability of detection by a side L type IAC ABAE escort of a CASD defender.
PDALSF(ILS,L)	Probability of detection by a side L type ILS long range SAM providing area defense in front of forward airbases of an enemy aircraft.
PDALSR(ILS,L)	Probability of detection by a side L type ILS long range SAM providing area defense in front of rear airbases of an enemy aircraft.

Variable	Definition
PDALSZ(ILS,L)	Probability of detection by a side L type ILS long range SAM providing area defense in front of COMMZ airbases of an enemy aircraft.
PDAMSF(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing area defense in front of forward airbases of an enemy aircraft.
PDAMSR(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing area defense in front of rear airbases of an enemy aircraft.
PDAMSZ(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing area defense in front of COMMZ airbases of an enemy aircraft.
PDANS(IAC,L)	Probability that a side L type IAC aircraft detects an unsheltered aircraft on a typical actual airbase.
PDASSB(IAC,L)	Probability of detection by a side L type IAC ABA SAM suppressor of an enemy belt SAM.
PDBBSS(ILS,L)	Probability of detection by a side L type ILS long range SAM in the belt of an enemy belt SAM suppressor.
PDBSCA(ILS,L)	Probability of detection by a side L type ILS long range SAM in the belt of an enemy CAS aircraft.
PDBSFB(ILS,L)	Probability of detection by a side L type ILS long range SAM in the belt of an enemy aircraft trying to fly by to targets farther to the rear.
PDBSSB(IAC,L)	Probability of detection by a side L type IAC belt SAM suppressor of an enemy belt SAM.
PDCDAS(IAC,L)	Probability of detection by a side L type IAC CASD aircraft of an enemy CASA or CASS aircraft.
PDCDCE(IAC,L)	Probability of detection by a side L type IAC CASD aircraft of an enemy CASE aircraft.
PDCDFB(IAC,L)	Probability of detection by a side L type IAC CASD aircraft defending units in combat of an enemy aircraft trying to fly by to targets farther to the rear.
PDCECD(IAC,L)	Probability of detection by a side L type IAC CASE aircraft of an enemy CASD aircraft.

Variable	Definition
PDDASF(IAC,L)	Probability of detection by a side L type IAC ABD defender in front of forward airbases of an enemy attacker or SAM suppressor.
PDDASR(IAC,L)	Probability of detection by a side L type IAC ABD defender in front of rear airbases of an enemy attacker or SAM suppressor.
PDDASZ(IAC,L)	Probability of detection by a side L type IAC ABD defender in front of COMMZ airbases of an enemy or SAM suppressor.
PDDEF(IAC,L)	Probability of detection by a side L type IAC ABD defender in front of forward airbases of an enemy escort aircraft.
PDDER(IAC,L)	Probability of detection by a side L type IAC ABD defender in front of rear airbases of an enemy escort aircraft.
PDDEZ(IAC,L)	Probability of detection by a side L type IAC ABD defender in front of COMMZ airbases of an enemy escort aircraft.
PDDH(IAC,L)	Probability that a side L type IAC defender detects an enemy helicopter.
PDEABD(IAC,L)	Probability of detection by a side L type IAC ABAE escort of an ABD defender.
PDHMS(L)	Probability that a side L helicopter detects an enemy medium range SAM.
PDMSCA(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing point defenses of units in combat of an enemy attacker (CAS).
PDMSCF(IMS,L)	Probability of detection by a side L type IMS medium range SAM defending units in combat of an enemy aircraft trying to fly by to targets farther to the rear.
PDMSCS(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing point defenses of units in combat of an enemy SAM suppressor (CASS).
PDMSH(IMS,L)	Probability that a side L type IMS medium range SAM detects an enemy helicopter.

Variable	Definition
PDPMSF(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing point defenses at forward airbases of an enemy attacker of SAM suppressor.
PDPMSI(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing point defenses at interdiction targets of an enemy attacker or SAM suppressor.
PDPMSR(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing point defenses at rear airbases of an enemy attacker or SAM suppressor.
PDPMSZ(IMS,L)	Probability of detection by a side L type IMS medium range SAM providing point defenses at COMMZ airbases of an enemy attacker or SAM suppressor.
PDSALS(IAC,L)	Probability of detection by a side L type IAC SAM-suppressor of an enemy long range SAM providing area defense.
PDSAMS(IAC,L)	Probability of detection by a side L type IAC SAM-suppressor of an enemy medium range SAM providing area defense.
PDSHL(IAC,L)	Probability that a side L type IAC aircraft detects a shelter on a typical actual airbase.
PDSMSC(IAC,L)	Probability of detection by a side L type IAC SAM-suppressor of an enemy medium range SAM providing point defense of units in combat.
PDSPMS(IAC,L)	Probability of detection by a side L type IAC SAM-suppressor of an enemy medium range SAM providing point defense at airbases or interdiction sites.
PENCOR(IS,L)	Number of penetration corridors in sector IS for side L penetrators.
PHJOR(L)	Probability that a side L helicopter returns home without delivering its ordnance if it is engaged by an enemy aircraft.
PKAD(IAC,KAC,L)	Probability of kill by a side L type IAC attacker of a type KAC defender if they are engaged.

Variable	Definition
PKANSD(IAC,II,L)	Probability that a side L type IAC aircraft kills an unsheltered aircraft giver that it shoots at one (where II is as below).
PKASD(IAC,II,L)	Probability that a side L type IAC aircraft kills an aircraft in a shelter given that it shoots at a shelter containing an aircraft, where II is as below:

II =

1, if the attacker flew from a forward airbase to an enemy forward airbase.
2, if the attacker flew from a forward airbase to an enemy rear airbase.
3, if the attacker flew from a forward airbase to an enemy COMMZ airbase.
4, if the attacker flew from a rear airbase to an enemy forward airbase.
5, if the attacker flew from a rear airbase to an enemy rear airbase.
6, if the attacker flew from a rear airbase to an enemy COMMZ airbase.
7, if the attacker flew from a COMMZ airbase to an enemy forward airbase.
8, if the attacker flew from a COMMZ airbase to an enemy rear airbase.
9, if the attacker flew from a COMMZ airbase to an enemy COMMZ airbase.

PKDAS(IAC,KAC,L)	Probability of kill by side L type IAC defender of a type KAC attacker or SAM suppressor if they are engaged.
PKDE(IAC,KAC,L)	Probability of kill by a side L type IAC defender or a type KAC escort if they are engaged.
PKDH(IAC,L)	Probability that a side L type IAC defender kills an enemy helicopter given detection and engagement.
PKED(IAC,KAC,L)	Probability of kill by a side L type IAC escort of a type KAC defender if they are engaged.
PKHMS(IMS,L)	Probability that an enemy helicopter kills a side L type IMS medium range SAM given detection and engagement.
PKLSA(ILS,IAC,L)	Probability of kill by a side L type ILS long range SAM of enemy type IAC aircraft.

Variable	Definition
PKMSA(IMS,IAC,L)	Probability of kill by a side L type IMS medium range SAM of enemy type IAC aircraft.
PKMSH(IMS,L)	Probability that a side L type IMS medium range SAM kills an enemy helicopter given detection and engagement.
PKNUPS(L)	Probability that a side L ABA aircraft kills an unsheltered aircraft given that the airbase is unprotected by point SAMs. (PKNUPS(L) ≥ PKANSD).
PKSSLS(ILS,L)	Probability that a side L type ILS long range SAM that has been suppressed by one or more enemy SAM suppressors is killed by those suppressors.
PKSSMS(IMS,L)	Probability that a side L type IMS medium range SAM that has been suppressed by one or more enemy SAM suppressors is killed by those suppressors.
PKSUPS(L)	Probability that a side L ABA aircraft kills a sheltered aircraft given that the airbase is unprotected by point SAMs. (PKSUPS(L) ≥ PKASD).
PMRSC(IMS,IS,L)	Number of side L type IMS medium range SAMs providing point defenses for units in combat in sector IS.
PMRSF(IMS,IS,L)	Number of side L type IMS medium range SAMs providing point defenses for forward airbases in sector IS.
PMSRI(IMS,IS,L)	Number of side L type IMS medium range SAMs providing point defenses for interdiction targets in sector IS.
PMRSR(IMS,IS,L)	Number of side L type IMS medium range SAMs providing point defenses for rear airbases in sector IS.
PMRSZ(IMS,L)	Number of side L type IMS medium range SAMs providing point defenses for COMMZ airbases.
PSJOR(IAC,L)	Probability that a SAM suppressor of type IAC on side L, when engaged by an enemy defender, jettisons its ordnance and returns fire (otherwise it tries to outrun the defender).
PSSSLS(IAC,ILS,L)	Probability of suppression by a side L type IAC SAM suppressor of enemy type ILS long range SAMs.

Variable	Definition
PSSSMS(IAC,IMS,L)	Probability of suppression by a side L type IAC SAM suppressor of enemy type IMS medium range SAMs.
QRACZ(J,L)	Number of side L type J QRA aircraft on COMMZ airbases.
QRAFS(J,IS,L)	Number of side L type J QRA aircraft on forward airbases in sector IS.
QRARS(J,IS,L)	Number of side L type J QRA aircraft on rear airbases in sector IS.
REPLA(IAC,L)	Number of side L type IAC aircraft in the replacement pool.
REPLH(L)	Number of side L helicopters in the replacement pool.
REPLLS(ILS,L)	Number of side L type ILS long range SAMs in the replacement pool.
REPLMS(IMS,L)	Number of side L type IMS long range SAMs in the replacement pool.
RRAAB(IAC,L)	Repair rate for damaged side L type IAC aircraft that are on an operating airbase.
RRAPL(IAC,L)	Repair rate for damaged side L type IAC aircraft that are in the repair pool.
RRHPL(L)	Repair rate for damaged side L helicopters that are in the repair pool.
RRLSPL(ILS,L)	Repair rate for damaged side L type ILS long range SAMs that are in the repair pool.
RRMSPL(IMS,L)	Repair rate for damaged side L type IMS medium range SAMs that are in the repair pool.
RSMIN(L)	Minimum raid size for attacking airbases--used to determine the number of airbases that will be attacked by side L.
RUNCLO(IAC,L)	Quantity of enemy ordnance which, if delivered on an airbase and no runway repairs are made, will prevent type IAC aircraft on side L from taking off.

Variable	Definition
RUNEFF(II,L)	This variable, along with RUNCLO, determines the fraction of side L type IAC aircraft that can take off as a function of the unrepaired damage to runways on an airbase. For II=1 it is the value of this fraction at which the function has a breakpoint. For II=2 it is the slope beyond the breakpoint. (This slope must be less than zero.)
RUNKIL(IAC,L)	The quantity of ordnance (in terms of damage to runways) that side L type IAC aircraft can carry from forward airbases to enemy forward airbases. (Range-payload tradeoffs are made using PKASD.)
RUNRCP(L)	Total undegraded runway repair capability on side L. After this much repair capability has been used, repairs are made at a degraded rate.
RUNRDG(L)	Runway repair degradation factor which is considered after RUNRCP has been used up on side L. (=1. if no degradation occurs, =0. if no capability at all remains after RUNRCP is gone, intermediate values are allowed.)
RUNRPF(ID,IS,L)	The amount of damage to runways that can be repaired on a forward airbase in sector IS on side L between cycles where ID=1 gives the overnight repair rate and ID=2 gives the daytime repair rate.
RUNRPR(ID,IS,L)	The amount of damage to runways that can be repaired on a rear airbase in sector IS on side L between cycles, where ID=1 gives overnight repair rate and ID=2 gives the daytime repair rate.
RUNRPZ(ID,L)	The amount of damage to runways that can be repaired on a COMMZ airbase on side L between cycles, where ID=1 gives the overnight repair rate and ID=2 gives the daytime repair rate.
SACFRB(IS,I,L)	Number of shelters for aircraft on forward (I=1) or rear (I=2) airbases in sector IS for side L.
SACZB(L)	Number of shelters for aircraft on COMMZ airbases for side L.
SAICCS(I,IS,L)	SAM availability input for SAM Command and Control by sector. This input is currently not used.

Variable	Definition
SMXRPL(L)	Maximum number of side L SAMs of any type that can be repaired in one cycle in the repair pool.
SNASBA(L)	Smallest number of weighted aircraft on side L (considering shelters) before enemy missions are changed to CAS missions.
SRACM(IAC,II,L)	
II = 1	1, sortie rate for type IAC side L aircraft on BSSUP mission.
II = 2	2, sortie rate for type IAC side L aircraft on CASD mission.
II = 3	3, sortie rate for type IAC side L aircraft on ABAD mission.
II = 4	4, sortie rate for type IAC side L aircraft on ABAA mission.
II = 5	5, sortie rate for type IAC side L aircraft on CASA mission.
II = 6	6, sortie rate for type IAC side L aircraft on INTDA mission.
II = 7	7, sortie rate for type IAC side L aircraft on ABAE mission.
II = 8	8, sortie rate for type IAC side L aircraft on CASE mission.
SRHELI(L)	Sortie rate for helicopters on side L.
SRICCF(IS,L)	Sortie rate factor which adjusts input sortie rates to account for Command and Control considerations for aircraft based on forward airbases in sector IS on side L. (This variable can also be used to adjust sortie rates for other factors that depend only on the location of the notional home airbase.)
SRICCR(IS,L)	Sortie rate factor which adjusts input sortie rates to account for Command and Control considerations for aircraft based on rear airbases in sector IS on side L. (This variable can also be used to adjust sortie rates for other factors that depend only on the location of the notional home airbase.)
SRICCZ(L)	Sortie rate factor which adjusts input sortie rates to account for Command and Control considerations for side L COMM based aircraft. (This variable can also be used to adjust sortie rates for other factors that depend only on the location of the notional home airbase.)

Variable	Definition
TAINTD(IS,L)	Number of interdiction target areas in sector IS on side L.
TMAXA(IAC,L)	Maximum number of operational type IAC aircraft on side L in theater (no more will be sent out from the replacement pool after this maximum is reached).
TMAXH(L)	Maximum number of operational helicopters on side L in theater (no more will be sent out from the replacement pool after this maximum is reached).
TMAXLS(ILS,L)	Maximum number of operational type ILS long range SAMs on side L in theater (no more will be sent out from the replacement pool after this maximum is reached).
TMAXMS(IMS,L)	Maximum number of operational type IMS medium range SAMs on side L in theater (no more will be sent out from the replacement pool after this maximum is reached).
TSCLSP(ILS,L)	Total number of shots per cycle that a side L type ILS long range SAM can potentially make (if it has enough missiles and targets).
TSCMSP(IMS,L)	Total number of shots per cycle that a side L type IMS long range SAM can potentially make (if it has enough targets and missiles or ammunition).
VAMBAS(IAM,II,L)	The base value of a type IAM air munition on side L used on mission II, where II=1, denotes CAS, II=2 denotes INTD.
VAMCFX(I,L)	See NVAMCF.
VAMCFY(II,I,L)	See NVAMCF.
VAMQFX(I,L)	See NVAMQF.
VAMQFY(II,I,L)	See NVAMQF.
VHELIS(L)	Base value of one helicopter sortie for side L.
VMRSC(IMS,L)	Base value of one side L type IMS short range SAM in combat sectors.
WCACAS	Width of a normal combat area in which CAS interactions can take place (in each sector).

Variable	Definition
WCOR(L)	Width of each penetration corridor for side L penetrators.
WFAMOE(IAC,L)	Weighting factor for comparing aircraft on side L used for constructing one-dimensional MOEs.
WFCDMA(L)	Weighting factor for comparing damaged aircraft with undamaged aircraft on side L.
WFCNSA(L)	Weighting factor for comparing unsheltered aircraft with sheltered aircraft on side L.
WFCQRA(L)	Weighting factor for comparing QRA aircraft with non-QRA aircraft on side L.
WFCRA(L)	Weighting factor for comparing rear based aircraft with forward based aircraft on side L.
WFCZA(L)	Weighting factor for comparing COMMZ based aircraft with forward based aircraft on side L.
WFHLRM(L)	Weighting factor for comparing helicopter with with aircraft on side L for computing loss-rate MOEs.
WFHMOE(L)	Weighting factor for comparing helicopters on side L used for constructing one-dimensional MOEs.
WFLMOE(ILS,L)	Weighting factor for comparing long range SAMs on side L for constructing one-dimensional MOEs.
WFMMOE(IMS,L)	Weighting factor for comparing medium range SAMs on side L used for constructing one-dimensional MOEs.
WIDS(IS)	Width of sector IS.
WPSPKC(L)	Number (weighted) of point SAMs defending a typical actual airbase on side L at which the ABA air-to-ground probability of kill changes.

Section 2

ALPHABETICAL LIST OF WORKING VARIABLES

Variable	Definition
ABAAFA(IAC)	Number of ABAAF aircraft of type IAC that are alive and continuing on mission.
ABAAFD(IAC)	Number of ABAAF aircraft of type IAC that are damaged but not killed.
ABAAFH(IAC)	Number of ABAAF aircraft of type IAC that are aborting mission and returning home undamaged.
ABAAFK(IAC)	Number of ABAAF aircraft of type IAC that are killed.
ABAARA(IAC)	Number of ABAAR aircraft of type IAC that are alive and continuing on mission.
ABAARD(IAC)	Number of ABAAR aircraft of type IAC that are damaged but not killed.
ABAARH(IAC)	Number of ABAAR aircraft of type IAC that are aborting mission and returning home undamaged.
ABAARK(IAC)	Number of ABAAR aircraft of type IAC that are killed.
ABAAZA(IAC)	Number of ABAAZ aircraft of type IAC that are alive and continuing on mission.
ABAAZD(IAC)	Number of ABAAZ aircraft of type IAC that are damaged but not killed.
ABAAZH(IAC)	Number of ABAAZ aircraft of type IAC that are aborting mission and returning home undamaged.
ABAAZK(IAC)	Number of ABAAZ aircraft of type IAC that are killed.

Variable	Definition
ABADFA(IAC)	Number of ABADF aircraft of type IAC that are alive and continuing on mission.
ABADFD(IAC)	Number of ABADF aircraft of type IAC that are damaged but not killed.
ABADFH(IAC)	Number of ABADF aircraft of type IAC that are aborting mission and returning home undamaged.
ABADFK(IAC)	Number of ABADF aircraft of type IAC that are killed.
ABADRA(IAC)	Number of ABADR aircraft of type IAC that are alive and continuing on mission.
ABADRD(IAC)	Number of ABADR aircraft of type IAC that are damaged but not killed.
ABADRH(IAC)	Number of ABADR aircraft of type IAC that are aborting mission and returning home undamaged.
ABADRK(IAC)	Number of ABADR aircraft of type IAC that are killed.
ABADZA(IAC)	Number of ABADZ aircraft of type IAC that are alive and continuing on mission.
ABADZD(IAC)	Number of ABADZ aircraft of type IAC that are damaged but not killed.
ABADZH(IAC)	Number of ABADZ aircraft of type IAC that are aborting mission and returning home undamaged.
ABADZK(IAC)	Number of ABADZ aircraft of type IAC that are killed.
ABAEFA(IAC)	Number of ABAEF aircraft of type IAC that are alive and continuing on mission.
ABAEFD(IAC)	Number of ABAEF aircraft of type IAC that are damaged but not killed.
ABAEFH(IAC)	Number of ABAEF aircraft of type IAC that are aborting mission and returning home undamaged.
ABAEFK(IAC)	Number of ABAEF aircraft of type IAC that are killed.

Variable	Definition
ABAERD(IAC)	Number of ABAER aircraft of type IAC that are damaged but not killed.
ABAERH(IAC)	Number of ABAER aircraft of type IAC that are aborting mission and returning home undamaged.
ABAERK(IAC)	Number of ABAER aircraft of type IAC that are killed.
ABAEZA(IAC)	Number of ABAEZ aircraft of type IAC that are alive and continuing on mission.
ABAEZD(IAC)	Number of ABAEZ aircraft of type IAC that are damaged but not killed.
ABAEZH(IAC)	Number of ABAEZ aircraft of type IAC that are aborting mission and returning home undamaged.
ABAEZK(IAC)	Number of ABAEZ aircraft of type IAC that are killed.
ABAFA(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA attack missions against forward airbases in sector IS.
ABAFD(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA defense missions for forward airbases in sector IS.
ABAFE(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA escort missions against forward airbases in sector IS.
ABAFS(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA SAM suppression missions against forward airbases in sector IS.
ABARA(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA attack missions against rear airbases in sector IS.
ABARD(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA defense missions for rear airbases in sector IS.
ABARE(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA escort missions against rear airbases in sector IS.

Variable	Definition
ABARS(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA SAM suppression missions against rear airbases in sector IS.
ABASFA(IAC)	Number of ABASF aircraft of type IAC that are alive and continuing on mission.
ABASFD(IAC)	Number of ABASF aircraft of type IAC that are damaged but not killed.
ABASFH(IAC)	Number of ABASF aircraft of type IAC that are aborting mission and returning home undamaged.
ABASFK(IAC)	Number of ABASF aircraft of type IAC that are killed.
ABASRA(IAC)	Number of ABASR aircraft of type IAC that are alive and continuing on mission.
ABASRD(IAC)	Number of ABASR aircraft of type IAC that are damaged but not killed.
ABASRH(IAC)	Number of ABASR aircraft of type IAC that are aborting mission and returning home undamaged.
ABASRK(IAC)	Number of ABASR aircraft of type IAC that are killed.
ABASZA(IAC)	Number of ABASZ aircraft of type IAC that are alive and continuing on mission.
ABASZD(IAC)	Number of ABASZ aircraft of type IAC that are damaged but not killed.
ABASZH(IAC)	Number of ABASZ aircraft of type IAC that are aborting mission and returning home undamaged.
ABASZK(IAC)	Number of ABASZ aircraft of type IAC that are killed.
ABAZA(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA attack missions against the COMMZ through sector IS.
ABAZD(IAC,L)	Number of aircraft (sorties) of type IAC on side L flying ABA defense missions for airbases in the COMMZ.

Variable	Definition
ABAZE(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA escort missions against airbases in the COMMZ through sector IS.
ABAZS(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying ABA SAM suppression missions against airbases in the COMMZ through sector IS.
ACCZDC(IAC,L)	Number of side L type IAC aircraft based on COMMZ airbases that were damaged in air combat during the cycle.
ACCZKC(IAC,L)	Number of side L type IAC aircraft based on COMMZ airbases that were killed in air combat during the cycle.
ACFSDC(IAC,IS,L)	Number of side L type IAC aircraft based on forward airbases in sector IS that were damaged in air combat during the cycle.
ACFSKC(IAC,IS,L)	Number of side L type IAC aircraft based on forward airbases in sector IS that were killed in air combat during the cycle.
ACRSDC(IAC,IS,L)	Number of side L type IAC aircraft based on rear airbases in sector IS that were damaged in air combat during the cycle.
ACRSKC(IAC,IS,L)	Number of side L type IAC aircraft based on rear airbases in sector IS that were killed in air combat during the cycle.
AFABS	Additional fraction of aircraft sent on belt suppression missions.
AFACA	Additional fraction of aircraft sent on CASA missions.
AFACE	Additional fraction of aircraft sent on CASE missions.
ALRSFA(ILS)	Number of area long range SAMs of type ILS defending forward airbases that are alive and operating.
ALRSFD(ILS)	Number of area long range SAMs of type ILS defending forward airbases that are damaged but not killed.

Variable	Definition
ALRSFS(ILS)	Number of area long range SAMs of type ILS defending forward airbases that are suppressed.
ALRSRA(ILS)	Number of area long range SAMs of type ILS defending rear airbases that are alive and operating.
ALRSRD(ILS)	Number of area long range SAMs of type ILS defending rear airbases that are damaged but not killed.
ALRSRK(ILS)	Number of area long range SAMs of type ILS defending rear airbases that are killed.
ALRSRS(ILS)	Number of area long range SAMs of type ILS defending rear airbases that are suppressed.
ALRSZA(ILS)	Number of area long range SAMs of type ILS defending COMMZ airbases that are alive and operating.
ALRSZD(ILS)	Number of area long range SAMs of type ILS defending COMMZ airbases that are damaged but not killed.
ALRSZK(ILS)	Number of area long range SAMs of type ILS defending COMMZ airbases that are killed.
ALRSZS(ILS)	Number of area long range SAMs of type ILS defending COMMZ airbases that are suppressed.
AMECC(IAM,L)	Number of side L type IAM air munition expended on CASA missions during the cycle.
AMEIC(IAM,L)	Number of side L type IAM air munition expended on INTDA missions during the cycle.
AMLFD(IAC,IS,L)	Air munition load factor to account for distance of aircraft flying on CAS missions.
AMLFDI(IAC,IS,L)	Air munition load factor to account for distance of aircraft flying on interdiction missions.
AMRSFA(IMS)	Number of area medium SAMs of type IMS defending forward airbases that are alive and operating.
AMRSFD(IMS)	Number of area medium range SAMs of type IMS defending forward airbases that are damaged but not killed.

Variable	Definition
AMRSFK(IMS)	Number of area medium range SAMs of type IMS defending forward airbases that are killed.
AMRSFS(IMS)	Number of area medium range SAMs of type IMS defending forward airbases that are suppressed.
AMRSRA(IMS)	Number of area medium range SAMs of type IMS defending rear airbases that are alive and operating.
AMRSRD(IMS)	Number of area medium range SAMs of type IMS defending rear airbases that are damaged but not killed.
AMRSRK(IMS)	Number of area medium range SAMs of type IMS defending rear airbases that are killed.
AMRSRS(IMS)	Number of area medium range SAMs of type IMS defending rear airbases that are suppressed.
AMRSZA(IMS)	Number of area medium range SAMs of type IMS defending COMMZ airbases that are alive and operating.
AMRSZD(IMS)	Number of area medium range SAMs of type IMS defending COMMZ airbases that are damaged but not killed.
AMRSZK(IMS)	Number of area medium range SAMs of type IMS defending COMMZ airbases that are killed.
AMRSZS(IMS)	Number of area medium range SAMs of type IMS defending COMMZ airbases that are suppressed.
ASPLAB	Number of aircraft sent from the replacement pool to airbases at the end of the cycle.
BLRSA(ILS)	Number of belt long range SAMs of type ILS defending in the belt that are alive and operating.
BLRSD(ILS)	Number of belt long range SAMs of type ILS defending in the belt that are damaged but not killed.
BLRSK(ILS)	Number of belt long range SAMs of type ILS defending in the belt that are killed.

Variable	Definition
BLRSS(ILS)	Number of belt long range SAMs of type ILS defending in the belt that are suppressed.
BSSUP(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying belt SAM suppression missions into sector IS.
BSSUPA(IAC)	Number of BSSUP aircraft of type IAC that are alive and continuing on mission.
BSSUPD(IAC)	Number of BSSUP aircraft of type IAC that are damaged but not killed.
BSSUPH(IAC)	Number of BSSUP aircraft of type IAC that are aborting mission and returning home undamaged.
BSSUPK(IAC)	Number of BSSUP aircraft of type IAC that are killed.
CAAFSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA attack missions (to all forward airbases): sorties attempted (II=1) or aircraft killed (II=2).
CAARSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA attack missions (to all rear airbases): sorties attempted (II=1) or aircraft killed (II=2).
CAAZSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA attack missions (to all COMMZ airbases): sorties attempted (II=1) or aircraft killed (II=2).
CACQF(J,L)	Cumulative number of side L type IAC aircraft on all forward airbases that are converted to QRA aircraft.
CACQR(J,L)	Cumulative number of side L type IAC aircraft on all rear airbases that are converted to QRA aircraft.
CACQZ(J,L)	Cumulative number of side L type IAC aircraft on all COMMZ airbases that are converted to QRA aircraft.
CADAM(IAC,L)	Cumulative side L type IAC aircraft that have been damaged.
CADFSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA defense missions (protecting all forward airbases): sorties attempted (II=1) or aircraft killed (II=2).

Variable	Definition
CADRSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA defense missions (protecting all rear airbases): sorties attempted (II=1) or aircraft killed (II=2).
CADZSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA defense missions (protecting all COMMZ airbases): sorties attempted (II=1) or aircraft killed (II=2).
CAEFSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA escort missions (to all forward airbases): sorties attempted (II=1) or aircraft killed (II=2).
CAERSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA escort missions (to all rear airbases): sorties attempted (II=1) or aircraft (II=2).
CAEZSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA escort missions (to all COMMZ airbases): sorties attempted (II=1) or aircraft killed (II=2).
CAKAS(II,IAC,L)	Cumulative type IAC aircraft killed in the air by shooters on side L of class II where: II = 1, for attack and suppression aircraft. 2, for escort aircraft. 3, for defense aircraft. 4, for long range SAMs. 5, for medium range SAMs.
CAKNSF(IAC,L)	Cumulative number of side L type IAC undamaged aircraft on all forward airbases that are killed on the ground not in shelters.
CAKNSR(IAC,L)	Cumulative number of side L type IAC undamaged aircraft on all rear airbases that are killed on the ground not in shelters.
CAKNSZ(IAC,L)	Cumulative number of side L type IAC undamaged aircraft on all COMMZ airbases that are killed on the ground not in shelters.
CAKSHF(IAC,L)	Cumulative number of side L type IAC undamaged aircraft on all forward airbases that are killed on the ground in shelters.
CAKSHR(IAC,L)	Cumulative number of side L type IAC undamaged aircraft on all rear airbases that are killed on the ground in shelters.

Variable	Definition
CAKSHZ(IAC,L)	Cumulative number of side L type IAC undamaged aircraft on all COMMZ airbases that are killed on the ground in shelters.
CALSFK(ILS,L)	Cumulative area side L type ILS long range SAMs protecting forward airbases that are killed.
CALSRK(ILS,L)	Cumulative area side L type ILS long range SAMs protecting rear airbases that are killed.
CALSZK(ILS,L)	Cumulative area side L type ILS long range SAMs protecting COMMZ airbases that are killed.
CAMECI(IAM,L)	Cumulative number of side L type IAM air munitions expended on all CASA and INTD missions.
CAMSFK(IMS,L)	Cumulative area side L type IMS medium range SAMs protecting forward airbases that are killed.
CAMSRK(IMS,L)	Cumulative area side L type IMS medium range SAMs protecting rear airbases that are killed.
CAMSZK(IMS,L)	Cumulative area side L type IMS medium range SAMs protecting COMMZ airbases that are killed.
CAREPD(IAC,L)	Cumulative side L type IAC aircraft that have been repaired.
CASA(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying CAS attack missions into sector IS.
CASAA(IAC)	Number of CAS aircraft of type IAC that are alive and continuing on mission.
CASAD(IAC)	Number of CAS aircraft of type IAC that are damaged but not killed.
CASAH(IAC)	Number of CAS aircraft of type IAC that are aborting mission and returning home undamaged.
CASAK(IAC)	Number of CAS aircraft of type IAC that are killed.
CASD(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying CAS defense (battlefield defense) missions into sector IS.
CASDA(IAC)	Number of CASD aircraft of type IAC that are alive and continuing on mission.

Variable	Definition
CASDD(IAC)	Number of CASD aircraft on type IAC that are damaged but not killed.
CASDH(IAC)	Number of CASD aircraft of type IAC that are aborting mission and returning home undamaged.
CASDK(IAC)	Number of CASD aircraft of type IAC that are killed.
CASE(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying CAS escort missions into sector IS.
CASEA(IAC)	Number of CASE aircraft of type IAC that are alive and continuing on mission.
CASED(IAC)	Number of CASE aircraft of type IAC that are damaged but not killed.
CASEH(IAC)	Number of CASE aircraft of type IAC that are aborting mission and returning home undamaged.
CASEK(IAC)	Number of CASE aircraft of type IAC that are killed.
CASFSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA SAM suppression missions (to all forward airbases): sorties attempted (II=1) or aircraft killed (II=2).
CASRSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA SAM suppression missions (to all rear airbases): sorties attempted (II=1) or aircraft killed (II=2).
CASS(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying CAS SAM suppression missions into sector IS.
CASSA(IAC)	Number of CASS aircraft of type IAC that are alive and continuing on mission.
CASSD(IAC)	Number of CASS aircraft of type IAC that are damaged but not killed.
CASSH(IAC)	Number of CASS aircraft of type IAC that are aborting mission and returning home undamaged.
CASSK(IAC)	Number of CASS aircraft of type IAC that are killed.

Variable	Definition
CASZSK(IAC,II,L)	Cumulative side L type IAC aircraft on ABA SAM suppression missions (to all COMMZ airbases): sorties attempted (II=1) or aircraft killed (II=2).
CBLSK(ILS,L)	Cumulative belt side L ILS long range SAMs that are killed.
CBSFSK(IAC,II,L)	Cumulative side L type IAC aircraft on belt suppression missions: sorties attempted (II=1) or aircraft killed (II=2).
CCACSK(IAC,II,L)	Cumulative side L type IAC aircraft on CAS attack missions (to all combat sectors): sorties attempted (II=1) or aircraft killed (II=2).
CCECSK(IAC,II,L)	Cumulative side L type IAC aircraft on CAS escort missions (to all combat sectors): sorties attempted (II=1) or aircraft killed (II=2).
CCDCSK(IAC,II,L)	Cumulative side L type IAC aircraft on CAS defense missions (to all combat sectors): sorties attempted (II=1) or aircraft killed (II=2).
CCSCSK(IAC,II,L)	Cumulative side L type IAC aircraft on CAS SAM suppression missions (to all combat sectors): sorties attempted (II=1) or aircraft killed (II=2).
CDAKNF(IAC,L)	Cumulative number of side L type IAC previously damaged aircraft on all forward airbases that are killed on the ground not in shelters.
CDAKNR(IAC,L)	Cumulative number of side L type IAC previously damaged aircraft on all rear airbases that are killed on the ground not in shelters.
CDAKNZ(IAC,L)	Cumulative number of side L type IAC previously damaged aircraft on all COMMZ airbases that are killed on the ground not in shelters.
CDAKSF(IAC,L)	Cumulative number of side L type IAC previously damaged aircraft on all forward airbases that are killed on the ground in shelters.
CDAKSR(IAC,L)	Cumulative number of side L type IAC previously damaged aircraft on all rear airbases that are killed on the ground in shelters.
CDAKSZ(IAC,L)	Cumulative number of side L type IAC previously damaged aircraft on all COMMZ airbases that are killed on the ground in shelters.

Variable	Definition
CHDAM(L)	Cumulative side L helicopters that have been repaired.
CHELSK(II,L)	Cumulative side L helicopters: sorties attempted (II=1) or aircraft killed (II=2).
CHREPD(L)	Cumulative side L helicopters that have been repaired.
CIAFSK(IAC,II,L)	Cumulative side L type IAC aircraft on INTD attack missions (to all INTD targets): sorties attempted (II=1) or aircraft killed (II=2).
CIEFSK(IAC,II,L)	Cumulative side L type IAC aircraft on INTD escort missions (to all INTD targets): sorties attempted (II=1) or aircraft killed (II=2).
CISFSK(IAC,II,L)	Cumulative side L type IAC aircraft on INTD defense missions (to all INTD targets): sorties attempted (II=1) or aircraft killed (II=2).
CLRSDM(ILS,L)	Cumulative side L type ILS long range SAMs that have been damaged.
CLSREP(ILS,L)	Cumulative side L type ILS long range SAMs that have been repaired.
CMRSDM(IMS,L)	Cumulative side L type IMS medium range SAMs that have been damaged.
CMSREP(IMS,L)	Cumulative side L type IMS long range SAMs that have been repaired.
CPMSCK(IMS,L)	Cumulative point side L type IMS medium range SAMs protecting combat sectors that are killed.
CPMSFK(IMS,L)	Cumulative point side L type IMS medium range SAMs protecting forward airbases that are killed.
CPMSIK(IMS,L)	Cumulative point side L type IMS medium range SAMs protecting interdiction targets that are killed.
CPMSRK(IMS,L)	Cumulative point side L type IMS medium range SAMs protecting rear airbases that are killed.
CPMSZK(IMS,L)	Cumulative point side L type IMS medium range SAMs protecting COMMZ airbases that are killed.

Variable	Definition
CQKNSF(J,L)	Cumulative number of side L type J QRA aircraft on all forward airbases that are killed on the ground not in shelters.
CQKNSR(J,L)	Cumulative number of side L type J QRA aircraft on all rear airbases that are killed on the ground not in shelters.
CQKNSZ(J,L)	Cumulative number of side L type J QRA aircraft on all COMMZ airbases that are killed on the ground not in shelters.
CQKSHF(J,L)	Cumulative number of side L type J QRA aircraft on all forward airbases that are killed on the ground in shelters.
CQKSHR(J,L)	Cumulative number of side L type J QRA aircraft on all rear airbases that are killed on the ground in shelters.
CQKSHZ(J,L)	Cumulative number of side L type J QRA aircraft on all COMMZ airbases that are killed on the ground in shelters.
CQRASF(L)	Change in QRA shortfall for side L.
CSABAF(IAC,L)	Cumulative successful side L type IAC ABA sorties to enemy forward airbases.
CSABAR(IAC,L)	Cumulative successful side L type IAC ABA sorties to enemy rear airbases.
CSABAZ(IAC,L)	Cumulative successful side L type IAC ABA sorties to enemy COMMZ airbases.
CSCASA(IAC,L)	Cumulative successful side L type IAC CAS sorties.
CSHELS(L)	Cumulative successful side L helicopter sorties.
CSINDA(IAC,L)	Cumulative successful side L type IAC INTD sorties.
CVAMD(II,L)	Cumulative value of side L air munitions delivered on missions II (II=1 denotes CASA, II=2 denotes INTDA).
CVAMDT(L)	Cumulative value of side L air munitions delivered on both CASA and INTDA missions (totaled).

Variable	Definition
CWAHC(L)	Cumulative weighted aircraft cycles plus helicopter cycles on side L.
CWAHKD(L)	Cumulative weighted aircraft and helicopters killed or damaged on side L.
FAAAFF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAA missions against forward airbases in sector KS.
FAAAFR(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAA missions against rear airbases in sector KS.
FAAAFZ(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAA missions against COMMZ airbases.
FAAARF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAA missions against forward airbases in sector KS.
FAAARR(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAA missions against rear airbases in sector KS.
FAAARZ(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAA missions against COMMZ airbases.
FAAAZF(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAA missions against forward airbases in sector KS.
FAAAZR(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAA missions against rear airbases in sector KS.
FAAAZZ(IAC,L)[2]	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAA missions against COMMZ airbases.

[1]Note: KSL = 1, implies KS = 1 and L = 1; KSL = 2, implies KS = 1 and L = 2; KSL = 3, implies KS = 2 and L = 1; and KSL = 4, implies KS = 2 and L = 2.

[2]Note: The F to Z and R to Z allocations assume that the aircraft penetrate through their own sector, the Z to Z allocations assume that FAMZS(KS,L) of the aircraft penetrate through sector KS.

Variable	Definition
FAADFF(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAD missions in front of forward airbases.
FAADRF(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAD missions in front of forward airbases.
FAADRR(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAD missions in front of rear airbases.
FAADZF(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAD missions in front of forward airbases.
FAADZR(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAD missions in front of rear airbases.
FAADZZ(IAC,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAD missions in front of COMMZ airbases.
FAAEFF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAE missions against forward airbases in sector KS.
FAAEFR(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAE missions against rear airbases in sector KS.
FAAEFZ(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAE missions against COMMZ airbases.
FAAERF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAE missions against forward airbases in sector KS.
FAAERR(IAC,IS,KSL)	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAE missions against rear airbases in sector KS.
FAAERZ(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAE missions against COMMZ airbases.

[1]See Footnote 1, page H-39.

Variable	Definition
FAAEZF(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAE missions against forward airbases in sector KS.
FAAEZR(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAE missions against rear airbases in sector KS.
FAAEZZ(IAC,L)[2]	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAE missions against COMMZ airbases.
FAASFF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAS missions against forward airbases in sector KS.
FAASFR(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAS missions against rear airbases in sector KS.
FAASFZ(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do ABAS missions against COMMZ airbases.
FAASRF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAS missions against forward airbases in sector KS.
FAASRR(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAS missions against rear airbases in sector KS.
FAASRZ(IAC,IS,L)	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do ABAS missions against COMMZ airbases.
FAASZF(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAS missions against forward airbases in sector KS.
FAASZR(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAS missions against rear airbases in sector KS.

[1]See Footnote 1, page H-39.

[2]See Footnote 2, page H-39.

Variable	Definition
FAASZZ(IAC,L)[2]	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do ABAS missions against COMMZ airbases.
FABSFF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do BSSUP missions into sector KS.
FABSRF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do BSSUP missions into sector KS.
FABSZF(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do BSSUP missions into sector KS.
FACAFC(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do CASA missions into sector KS.
FACARC(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do CASA missions into sector KS.
FACAZC(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do CASA missions into sector KS.
FACDFC(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do CASD missions into sector KS.
FACDRC(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do CASD missions into sector KS.
FACDZC(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do CASD missions into sector KS.
FACEFC(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do CASE missions into sector KS.

[1]See Footnote 1, page H-39.

[2]See Footnote 2, page H-39.

Variable	Definition
FACERC(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do CASE missions into sector KS.
FACEZC(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do CASE missions into sector KS.
FACSFC(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do CASS missions into sector KS.
FACSRC(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do CASS missions into sector KS.
FACSZC(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do CASS missions into sector KS.
FAIAFF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do INTDA missions into sector KS.
FAIARF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do INTDA missions into sector KS.
FAIAZF(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do INTDA missions into sector KS.
FAIEFF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do INTDE missions into sector KS.
FAIERF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do INTDE missions into sector KS.
FAIEZF(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do INTDE missions into sector KS.
FAISFF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from forward airbases in sector IS to do INTDS missions into sector KS.

[1]See Footnote 1, page H-39.

Variable	Definition
FAISRF(IAC,IS,KSL)[1]	Fraction of side L type IAC aircraft assigned from rear airbases in sector IS to do INTDS missions into sector KS.
FAISZF(IAC,KS,L)	Fraction of side L type IAC aircraft assigned from COMMZ airbases to do INTDS missions into sector KS.
FDEAF(IAC)	Fraction of defenders of type IAC that are able to engage attackers in forward areas.
FDEAR(IAC)	Fraction of defenders of type IAC that are able to engage attackers in rear areas.
FDEAZ(IAC)	Fraction of defenders of type IAC that are able to engage attackers in the COMMZ.
FDEAC(IAC)	Fraction of defenders of type IAC that are able to engage attackers in combat areas.
FVAMC	Factor for value of air munitions to account for the cycle in which they are delivered.
FVAMQ	Factor for value of air munitions to account for the quantity delivered during a cycle.
HELIA	Number of helicopters alive with their ordnance.
HELID	Number of helicopters damaged.
HELIH	Number of helicopters going home without delivering their ordnance.
HELIK	Number of helicopters killed.
HELIKC(IS,L)	Number of side L helicopters killed in sector IS during the cycle.
HSPLU	Number of helicopters sent from the replacement pool to units at the end of the cycle.
IINTOP	Index of interoperability of airbases computed from IINTPS(IS,L).
INTDA(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying interdiction (attack) missions into sector IS.

[1]See Footnote 1, page H-39.

Variable	Definition
INTDAA(IAC)	Number of INTDA aircraft of type IAC that are alive and continuing on mission.
INTDAD(IAC)	Number of INTDA aircraft of type IAC that are damaged but not killed.
INTDAH(IAC)	Number of INTDA aircraft of type IAC that are aborting mission and returning home undamaged.
INTDAK(IAC)	Number of INTDA aircraft of type IAC that are killed.
INTDE(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying interdiction escort missions into sector IS.
INTDEA(IAC)	Number of INTDE aircraft of type IAC that are alive and continuing on mission.
INTDED(IAC)	Number of INTDE aircraft of type IAC that are damaged but not killed.
INTDEH(IAC)	Number of INTDE aircraft of type IAC that are aborting mission and returning home undamaged.
INTDEK(IAC)	Number of INTDE aircraft of type IAC that are killed.
INTDS(IAC,IS,L)	Number of aircraft (sorties) of type IAC on side L flying interdiction SAM suppression missions into sector IS.
INTDSA(IAC)	Number of INTDS aircraft of type IAC that are alive and continuing on mission.
INTDSD(IAC)	Number of INTDS aircraft of type IAC that are damaged but not killed.
INTDSH(IAC)	Number of INTDS aircraft of type IAC that are aborting mission and returning home undamaged.
INTDSK(IAC)	Number of INTDS aircraft of type IAC that are killed.
JJ	Another index (besides J) for type of QRA aircraft.
NAEQRA	Number of types of aircraft eligible to be converted to QRA aircraft.

Variable	Definition
PMRSCA(IMS)	Number of point medium range SAMs of type IMS defending units in combat that are alive and operating.
PMRSCD(IMS)	Number of point medium range SAMs of type IMS defending units in combat that are damaged but not killed.
PMRSCK(IMS)	Number of point medium range SAMs of type IMS defending units in combat that are killed.
PMRSCS(IMS)	Number of point medium range SAMs of type IMS defending units in combat that are suppressed.
PMRSFA(IMS)	Number of point medium range SAMs of type IMS defending forward airbases that are alive and operating.
PMRSFD(IMS)	Number of point medium range SAMs of type IMS defending forward airbases that are damaged but not killed.
PMRSFK(IMS)	Number of point medium range SAMs of type IMS defending forward airbases that are killed.
PMRSFS(IMS)	Number of point medium range SAMs of type IMS defending airbases that are suppressed.
PMRSIA(IMS)	Number of point medium range SAMs of type IMS defending interdiction targets that are alive and operating.
PMRSID(IMS)	Number of point medium range SAMs of type IMS defending interdiction targets that are damaged but not killed.
PMRSIK(IMS)	Number of point medium range SAMs of type IMS defending interdiction targets that are killed.
PMRSIS(IMS)	Number of point medium range SAMs of type IMS defending interdiction targets that are suppressed.
PMRSRA(IMS)	Number of point medium range SAMs of type IMS defending rear airbases that are alive and operating.
PMRSRD(IMS)	Number of point medium range SAMs of type IMS defending rear airbases that are damaged but not killed.

Variable	Definition
PMRSRK(IMS)	Number of point medium range SAMs of type IMS defending rear airbases that are killed.
PMRSRS(IMS)	Number of point medium range SAMs of type IMS defending airbases that are suppressed.
PMRSZA(IMS)	Number of point medium range SAMs of type IMS defending COMMZ airbases that are alive and operating.
PMRSZD(IMS)	Number of point medium range SAMs of type IMS defending COMMZ airbases that are damaged but not killed.
PMRSZK(IMS)	Number of point medium range SAMs of type IMS defending COMMZ airbases that are killed.
PMRSZS(IMS)	Number of point medium range SAMs of type IMS defending COMMZ airbases that are suppressed.
REPARA(IAC)	Number of type IAC aircraft that are repaired during the cycle.
REPARH	Number of helicopters that are repaired during the cycle.
REPARL(ILS)	Number of type ILS long range SAMs that are repaired during the cycle.
REPARM(IMS)	Number of IMS medium range SAMs that are repaired during the cycle.
RUNDAM	Additional runway damage per airbase in the area in question (forward in a sector, rear in a sector, or COMMZ) caused by enemy airbase attack missions flown during the cycle in question.
RUNDMF(IS,L)	Current status of runway damage on an average forward airbase in sector IS on side L (i.e., cumulative damage minus repairs through the current cycle).
RUNDMR(IS,L)	Current status of runway damage on an average rear airbase in sector IS on side L (i.e., cumulative damage minus repairs through the current cycle).

Variable	Definition
RUNDMZ(L)	Current status of runway damage on an average COMMZ airbase on side L (i.e., cumulative damage minus repairs through the current cycle).
RUNFAC	Fraction of maximum runway repair capability made during the cycle.
SABAF(IAC,IS,L)	Number of successful ABA sorties by side L type IAC aircraft against forward airbases in sector IS.
SABAR(IAC,IS,L)	Number of successful ABA sorties by side L type IAC aircraft against rear airbases in sector IS.
SABAZ(IAC,L)	Number of successful ABA sorties by side L type IAC aircraft against COMMZ airbases.
SACZBK(L)	Number of shelters for aircraft on COMMZ airbases for side L that are killed.
SAFRBK(IS,I,L)	Number of shelters for aircraft on forward (I=1) or rear (I=2) airbases in sector IS for side L that are killed.
SCASA(IAC,IS,L)	Number of successful CAS sorties by side L type IAC aircraft against units in sector IS.
SHELI(IS,L)	Number of successful sorties of side L helicopters in sector IS.
SINTDA(IAC,IS,L)	Number of successful INTD sorties by side L type IAC aircraft against interdiction targets in sector IS.
SRRUND	Reduction in sortie rate applied to all aircraft based in the area in question (forward in a sector, rear in a sector, or COMMZ) due to the current status of runway damage on airbases in that area.
SSPLU	Number of SAMs sent from the replacement pool to units at the end of the cycle.
TACDM	Total number of damaged aircraft of all types on a notional airbase.
TACGT	Total (estimated) number of undamaged aircraft of all types on the ground as targets on a notional airbase.

Variable	Definition
TLRSSC(ILS,L)	Total side L type ILS long range SAMs suppressed during the cycle.
TMRSSC(IMS,L)	Total side L type IMS medium range SAMs suppressed during the cycle.
TQRAF	Total number of QRA aircraft of all types on forward airbases in sector IS for the side.
TQRAR	Total number of QRA aircraft of all types on COMMZ airbases for the side.
TQRAZ	Total number of QRA aircraft of all types on COMMZ airbases for the side.
TSCLRS(ILS,L)	Total shots per cycle that a long range ILS SAM can make.
TSCMRS(IMS,L)	Total shots per cycle that a medium range type IMS SAM can make.
UBABAF	Upper bound on the number of actual airbases that will be attacked when a notional forward airbase is attacked.
UBABAR	Upper bound on the number of actual airbases that will be attacked when a notional rear airbase is attacked.
UBABAZ	Upper bound on the number of actual airbases that will be attacked when a notional COMMZ airbase is attacked.
VAMB	Base value of air munitions delivered.
VAMDC(II,L)	Value of side L air munitions delivered during the cycle on mission II (II=1 denotes CASA, II=2 denotes INTDA).
WAHBC(L)	Weighted side L aircraft and helicopters operational at the beginning of the cycle.
WAHEC(L)	Weighted side L aircraft and helicopters operational at the end of the cycle.
WAHKDC(L)	Weighted side L aircraft and helicopters killed or damaged during the cycle.

Variable	Definition
WAHLRC(L)	Weighted side L aircraft and helicopter loss rate per cycle.
WAHRDC(L)	Weighted number of side L aircraft and helicopters repaired during the cycle.
WAHSFC(L)	Weighted number of side L aircraft and helicopter sorties flown during the cycle.
WSEC(L)	Weighted side L SAMs operational at the end of the cycle.
WTAFS(IS)	Weighted number of aircraft on forward airbases in sector IS.
WTARS(IS)	Weighted number of aircraft on rear airbases in sector IS.
WTAZ	Weighted number of aircraft or COMMZ airbases.
WTTA	Weighted total number of target aircraft.